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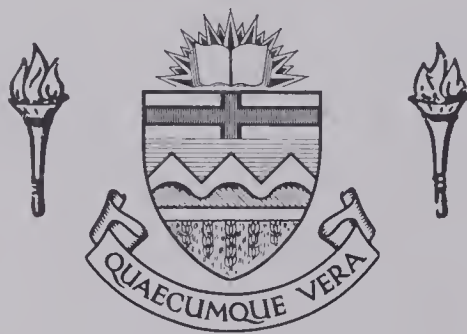
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THE UNIVERSITY OF ALBERTA  
AN INVESTIGATION OF THE ABILITY OF GRADE SIX STUDENTS  
TO READ SELECTED SOCIAL STUDIES MATERIAL

by



ROBERT RICHARD CARTER

A THESIS  
SUBMITTED TO THE FACULTY OF GRADUATE STUDIES  
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE  
OF MASTER OF EDUCATION

DEPARTMENT OF ELEMENTARY EDUCATION

EDMONTON, ALBERTA

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FACULTY OF GRADUATE STUDIES

The undersigned certify that they have read, and  
recommend to the Faculty of Graduate Studies for acceptance,  
a thesis entitled "An Investigation of the Ability of Grade  
Six Students to Read Selected Social Studies Material"  
submitted by Robert Richard Carter in partial fulfilment of  
the requirements for the degree of Master of Education.



## ABSTRACT

This study attempted to determine how well grade six students can read two types of word text and map combinations for specific, factual information, as compared to their ability to read such information from a word text or map as separate entities. In addition, the nature and extent of relationships between the variables mental ability, general reading ability, sex, and the ability to read word text and/or map presentations for factual information were investigated.

The student sample consisted of 200 grade six students attending four elementary schools in a small city in Northern Alberta. The students were randomly divided into four groups of fifty each. Each group was given a different presentation of the Map-Text Comparative Reading Test as a source of information. However, all four groups were required to answer the same series of twenty factual questions. Group 1 received the Word Text Presentation, which contained in a word text all of the factual information necessary to answer the twenty questions. Group 2 was given the Word plus Map Presentation, which provided a contiguous presentation of a word text and map, each of which contained all of the information necessary to answer the twenty questions. The Integrated Word and Map Presentation was given to Group 3. This was a contiguous presentation of a word text and map, each of which provided partial information for answering the twenty questions. Together they provided complete information for the task. Group 4 was provided with the Map Presentation. This consisted of a map only, which contained all of the factual information required to answer the twenty questions.

The Word Meaning and Paragraph Meaning Tests of the Stanford





Achievement Test Form W were administered to provide a measure of general reading ability, and the Cooperative School and College Ability Tests Form 4A were given to obtain a measure of mental ability.

The data were analyzed by means of test item analysis, one-way analysis of variance, and multiple regression analysis.

The results indicated that the students read the Word Text and Word plus Map Presentations with about equal success. Similarly, the means for the groups which received the Integrated Word and Map, and the Map Presentations were not significantly different. However, there were highly significant differences in group means in favour of the Word Text and Word plus Map Presentations as compared to the Integrated Word and Map, and the Map Presentations.

Significant interaction was found between the manner in which information was presented and sex. The girls scored significantly higher than the boys on the Word plus Map Presentation. The boys' superior performance on the Map Presentation approached significance. Neither mental ability nor general reading ability were found to interact significantly with the type of presentation of information, but both variables proved to be highly significant predictors of achievement on the Map-Text Comparative Reading Test.

In general, the findings of this study indicated that grade six students are not assisted by maps or combined word text and map presentations in reading social studies reference materials for factual information. Such information is utilized most effectively when presented in a word text. This might be attributed to a lack of development in map reading skills, an inability to gather and integrate factual information from a word text and map, or both.



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## CHAPTER I

### INTRODUCTION

Reading is not a generalized ability that once learned can be applied in any situation to any type of reading material. Although the development of what might be termed fundamental reading skills is essential for reading, there are many subjects taught in the schools in which the ability to use specialized reading skills is a necessity to facilitate understanding of the information being presented.

In social studies, reading ability is important because the range of direct experience students can have with topics of the curriculum is limited. Wesley (1952, p. 273) considers reading to be of importance in all subjects, but " . . . it is peculiarly so in social studies, for an understanding of historical, geographic, civic and economic realities can scarcely be gained in any other way."

Since the variety and amount of reading required in social studies is extensive, it is to be expected that the number of specialized skills required for efficient reading in this subject area is correspondingly great.

Map reading is an example of such a specialized skill. Authorities, such as Witucki (1962) and Kohn (1953), generally agree that the ability to read maps is a skill that must be learned and consequently, should be taught. Kennamer's (1964, p. 427) thinking concerning the complexity of map reading and the need for instruction in this area is representative of authorities in the field:

Map reading, like any other kind of reading, involves the ability to recognize and understand symbols. This includes not only reading of the symbols as such, but also reading from the map:



directions, distances, relative locations, size or any other of the geographical, statistical, political or cultural information maps are designed to show. These many skills and abilities for reading maps are not innate - they must be developed over a period of time. In other words, map reading is a teachable skill just as are the other skills.

The ability to read maps, then, is a very necessary skill in social studies. However, the ability to read a map by itself may not sufficiently ensure adequate communication between author and reader when the map is presented within the context of a social studies reference book. In these books, the map may be integrated with the written text in a manner which requires the reader to continuously switch back and forth between word text and map in order to gather complete information. What may be required in such a situation is to ensure the development of reading flexibility which would enable the reader to move smoothly from word text to map and back again without losing his continuity of thought.

## I. THE PROBLEM

An examination of reference books authorized for use in social studies in Alberta, reveals the extensive use of graphic material in presenting information. One type of graphic presentation, the map, is popular with authors, and maps appear frequently in most of the reference books. The manner in which the maps are incorporated within the written text varies between books, and even within the same book. In some instances, a map does not present any additional information, but reinforces the same information presented in the written text. In other reading situations, the map and written text are closely inter-related, each presenting different but related knowledge, making it







necessary for students to gather information from both the printed text and map to ensure complete communication. Occasionally, a map is used by itself to carry information not available in the printed text.

The majority of elementary school social studies curricula, including that authorized for use in Alberta schools, indicate that educational authorities are concerned with the need to develop map reading skills. The Alberta Elementary Curriculum Guide for Social Studies - Enterprise (Interim) outlines a complete program for grades one through six. As a result of this program, by the time students reach grade six, they are expected to have acquired considerable skill in interpreting map symbols, calculating distance, understanding direction, and locating places by means of a grid system.

The emphasis in this and other map reading programs is on developing skill in reading maps in isolation from other reading materials. But in his everyday work in social studies, the student often finds it necessary to read maps which are within the context of a social studies reference book. The manner in which the map is integrated with the printed text in presenting information probably makes it necessary for the student to possess reading skills in addition to those required for reading the map and word text as separate entities.

It appears then that textbook authors either assume students have skill in reading social studies materials containing information presented in map and written text combinations, or are not sensitive to the need for this reading skill. The same seems to be true of curriculum makers, because no provision has been made in either the social studies or reading programs in Alberta for appraising this skill or ensuring its development.



## II. PURPOSE OF THE STUDY

As previously stated, authors often incorporate maps within the written text in different ways. Therefore, in order to realistically assess the ability of students to utilize maps as sources of information, their skill in gaining information from various arrangements of maps and printed text should be investigated. In this way, it may be possible to gain some insight into the manner in which students obtain information from social studies reference books. A number of relevant questions which might be answered are: Do students rely primarily on the printed text to gain information from their social studies reference books, or do they have facility in gleaning such information from maps? Are they more proficient with some combination of printed word text and map?

More specifically, the purpose of this investigation was to determine whether or not the presence of combined map and word text presentations in social studies reference books pose reading problems for grade six students in addition to those encountered in reading a word text or map as distinct entities.

## III. DEFINITIONS

The following definitions designate the method in which factual, descriptive information was presented. This information was based on four topics: "Vegetation Regions of Canada", "Surface Features of British Columbia", "River Systems of the Prairie Provinces", and "Mining in New Brunswick and Nova Scotia".

1. Word Text Presentation: The reading material made up of a discourse which by itself contained all the information necessary to



answer a set of twenty factual questions presented in printed word form.

2. Word plus Map Presentation: Reading material in which there was a contiguous presentation of a map and a printed word text, each of which contained all the information necessary to answer a set of twenty factual questions presented in printed word form. In this presentation, the map and the written discourse were mutually reinforcing.

3. Integrated Word and Map Presentation: A contiguous presentation of written discourse and a map, each of which provided insufficient information to answer twenty factual questions, but between them provided all the necessary information required for this task.

4. Map Presentation: Reading material in the form of a map which by itself contained all the information necessary to answer a set of twenty factual questions presented in printed word form.

5. Reading Flexibility: The ability to go back and forth between a word text and map to gain information from each and to relate such information into a coherent, meaningful communication.

#### IV. QUESTIONS

From the statement of the purpose of the study the following questions were formulated:

1. Is there any significant difference in the reading achievement levels of randomly selected groups of grade six students on tests which present the same information in a printed word text which provides all the necessary information to answer a series of factual questions; a combination of printed word text and map, each of which contains all the information necessary to answer a set of questions; a combination of printed word text and map each of which does not provide sufficient information to answer a series of questions, but together provide





complete information for this purpose; and a map presentation which by itself provides all the necessary information to answer a series of factual questions?

2. Is there any significant interaction between each of the four methods of presenting information and each of the following variables:

- (a) mental ability
- (b) sex
- (c) general reading achievement

3. Are the following variables significant predictors of achievement in reading social studies discourse which contains map and/or printed word text presentations of information:

- (a) mental ability
- (b) sex
- (c) general reading achievement

4. Do grade six students appear to use a particular technique in reading a presentation of factual information which contains both a map and a printed word text?

5. When grade six students have been instructed to complete a test as quickly and as accurately as possible, is there any difference in the amount of time taken to complete the questions according to the type of presentation of information?

## V. HYPOTHESES

Questions one to three have been formulated in terms of null hypotheses and tested by means of selected statistical procedures. Informal observations made while testing was in progress were used to gain tentative answers to questions four and five.





The following null hypotheses were tested:

1. There is no significant difference in the reading achievement of randomly selected groups of grade six students on tests which present information in a:

- (a) Word Text Presentation
- (b) Word plus Map Presentation
- (c) Integrated Word and Map Presentation
- (d) Map Presentation

2. There is no significant interaction between the type of reading presentation of information and the:

- (a) mental ability
- (b) sex
- (c) general reading achievement of students

3. The following variables are not significant predictors of the achievement of grade six students on a test which measures the ability to read social studies discourse containing a map and/or printed word text:

- (a) mental ability
- (b) sex
- (c) general reading achievement

## VI. SIGNIFICANCE

Although students usually obtain information from reference books through the medium of words, they are often required to use reference books which present information in maps and in various combinations of maps and words.

If students do have difficulty obtaining information from maps or map and word presentations, a study in this area could direct the



attention of educators to an area of concern in the developmental reading and social studies programs.

Curriculum committees might benefit from such information in that it would provide some evidence as to the effectiveness of the current map reading program in the elementary schools. This study also may indicate a need for curriculum planners to focus more attention on developing "reading flexibility" or preparing students to read and gain information from materials which include various combinations of graphic devices and the printed word text.

The findings of this study may assist administrators in determining the emphasis which should be given to instruction in specialized reading skills in the various subjects taught in schools. In addition, it may help to make them more aware of the necessity of designating more precisely responsibility for instruction in particular types of reading. For example, is it the responsibility of the reading teacher to teach children how to read specialized materials as in the social studies, or is this the responsibility of the social studies teacher? Should reading and social studies teachers share this responsibility?

The findings of this study may have some significance for teacher educators. If the study demonstrates a lack of skill on the part of the students in map reading or combined map and word text reading, it is possible that teachers have not emphasized such skills in their teaching. If this is the case, the reasons may be a lack of awareness of the importance of such skills or insufficient knowledge of teaching techniques. The teacher educators might place then more emphasis on this aspect of reading in both reading and social studies curriculum and instruction courses.





The prescribed curriculum for social studies in the elementary schools of Alberta provides a developmental program for map reading to guide teachers. However, no such provision is made for the development of skills required in reading combined printed word text and maps. If the findings of this study indicate a lack of such skill among students, the attention of teachers could be directed to an area of concern in the developmental reading and social studies programs.

## VII. LIMITATIONS OF THE STUDY

1. A Latin Squares design could have increased the precision of the study, but the increased complexity of the analysis prompted the decision to use a treatment by subjects design.

2. The findings cannot be realistically applied to students outside the study sample. They can certainly be regarded as being suggestive of what might be the situation with other similar populations, but they do not prove anything concerning such populations.

3. The findings can only be considered as significant insofar as the Map-Text Comparative Reading Test is a genuine measure of the ability of students to read the types of word and map presentations they encounter in their social studies reference books.

4. The maps used on the Map-Text Comparative Reading Test did not make use of color, but were simply black and white maps. Although many of the maps which do appear in social studies books are not in color, a substantial number are colored. The effect of this color factor is unknown.

5. The findings of this study apply only to the literal





comprehension level for both map and word reading, and to the ability to relate together information of a purely factual nature.

6. The significance of mental ability and general reading ability as predictors of achievement in reading social studies discourse containing maps and word presentations is legitimate only to the degree that the tests used to measure these variables are acceptable instruments.

#### VIII. OVERVIEW OF THE STUDY

The remaining portion of this investigation has been organized into five chapters, which have been designated Chapters II to VI.

Chapter II provides a theoretical background for the study. A point of view concerning the reading process is presented as a conceptual model, and the skills required for reading in social studies have been discussed in relation to this model. The chapter then focuses on a particular type of social studies reading required for the reading of maps. Similarities and differences between the map reading process and the word reading process were presented. Since all types of reading are dependent on thinking, the chapter ends by presenting a view of thinking and discussing the interrelationships of reading and thinking.

Chapter III presents a review of the literature related to the topic under study. The chapter is divided into two major sections. The first deals with literature related to map reading and reviews: what map reading skills children are capable of learning; to what extent they have realized their map reading skill potential over the years; and what effects efforts to improve map reading skills have had on the academic performance of the students. The literature reviewed in this



connection included both the informed opinion of educators and actual research evidence. The second major section of Chapter III includes literature concerning the ability of children to read materials which contained both graphic and word presentations. Again, the informed opinions of educators as well as research evidence on this topic have been included.

Chapter IV describes the experimental design of the study and consists of five major sections, each of which is divided into several important subsections. The first major section is concerned specifically with the design of the study and presents information pertaining to the characteristics of the sample, the location of the study, and the manner in which the students were grouped for the study. The next major section of Chapter IV deals with the testing instruments which were used to secure data for analysis. The Word Meaning Test and Paragraph Meaning Test of the Stanford Achievement Tests Form W, and the Cooperative School and College Ability Test Form 4A are reviewed to justify their use. In addition, the purpose, organization, content, and item characteristics of the Map-Text Comparative Reading Test are discussed. The third major section of Chapter IV describes the pilot study and presents an analysis of results. The last two major sections of the chapter deal with the collection and treatment of the data for the main study. The statistical procedures used in the study included test item analysis, one-way analysis of variance, and multiple regression analysis.

The findings of the study have been reported in Chapter V in four sections. The first section reports the findings of a test item analysis of the final draft of the Map-Text Comparative Reading Test. The second



deals with the findings concerning the comparative skill with which the grade six students read the various presentations of the Map-Text Comparative Reading Test. The next section of Chapter V presents the results of multiple regression analysis which determined the nature and extent of the relationship between sex, general reading ability, and mental ability, and performance on the Map-Text Comparative Reading Test. The last major part of Chapter V gives the results of observations carried on while the Map-Text Comparative Reading Test was being administered. These results were concerned with the reading technique of the students, and the time taken to complete the various parts of the Map-Text Comparative Reading Test.

Chapter VI presents a summary of the study which is followed by a systematic review of the tenability of the null hypotheses. The two questions concerning reading technique and testing time are also briefly reviewed. The chapter ends with the conclusions and possible implications of the findings for educational practice, and suggestions for further research in the area with which this investigation was concerned.

In general, the emphasis in the study is on the analysis of reading problems in social studies. Therefore, although it is acknowledged that there are a number of interesting geographical aspects inherent in these problems, their treatment has not been extensive.





## CHAPTER II

### THEORETICAL BACKGROUND OF THE STUDY

#### I. INTRODUCTION

This chapter has been included to attempt to provide a theoretical framework for the investigation.

Since the study was concerned with the ability of students to read particular types of social studies material, one task in developing a theoretical framework was to present a point of view about the reading process. To this end a number of definitions of reading have been included, and a conceptual model of the reading process as conceived by Gray (1960) has been presented. Gray's (1960, p. 10) model consists of four major aspects of reading which include: word recognition, comprehension, reaction to what is read, and the fusion of new and old ideas. The adequacy of this model for the type of social studies reading involved in the study was discussed.

A number of authorities such as Stauffer (1965, p. 15), Kress (1960, p. 50), Smith (1963, p. 61), and Spache (1963, pp. 68-73) consider reading and thinking to be interdependent. Therefore, an attempt was made to relate the various aspects of Russell's (1956, p. 10) model of thinking to the process of reading as viewed in this study. The two major parts of Russell's (1956, p. 10) model of thinking have been discussed in some detail, and their relevance to reading established. These parts are the processes of thinking and the materials of thinking. According to Russell (1956, p. 10) the processes of thinking include: perceptual thinking; associative thinking; inductive and deductive thinking; problem solving; critical thinking; and creative thinking.





An attempt has been made to relate each of these processes to one of the aspects of reading. In addition, what Russell (1956, p. 10) designates the "materials of thought" have been discussed in terms of their importance to the reading process. The "materials of thought" include concepts, percepts, images, and memories.

## II. THE READING PROCESS

Reading has been defined in many ways by different authors. Burton (1956, pp. 15-16) defines reading very broadly as the "development of meanings in response to stimuli and for the purpose of guiding behaviour." He feels that the types of stimuli which people react to in this process of "reading" can be classified into three major categories: objects or things in the world; persons, social processes, and relationships; and symbols of varying degrees of abstractness. A golfer "reading" the green or a detective "reading" clues would be examples of the type of reading in the first category. The second category might include such things as "reading" the feelings of another person. The third category includes the types of reading of importance in this study. The ability to read maps and words in social studies reference books is a good example of the reading of symbols of various degrees of abstractness. Insofar as map reading is concerned, Jarolimek (1959, p. 170) notes that the symbols used vary in abstraction. The criterion he uses to judge this is the degree to which the symbol resembles the object being represented. According to this definition, the least abstract symbols would be pictorial and symbols such as lines, dots, and words would be classified as completely abstract.



While Burton's definition of reading is broad and can categorize the types of reading done in social studies, it is too general to serve as a basis for the discussion of components of the reading process within each of his three categories: objects or things; person, social processes, and relationships; and symbols of varying degrees of abstractness. Therefore, what is required is a definition of reading which is concerned with Burton's third category, but which accounts for various components of the reading process such as word perception, comprehension, reaction, and assimilation.

Spache (1962) seems to be closer to this point of view. In discussing reading comprehension he rejects the view that it is just a matter of obtaining meaning from the printed page. He states that:

Comprehension is also dependent upon the ideas the reader brings to his reading - his experiences, his reading background, his learnings. Comprehension is more than understanding the ideas conveyed by the printed word, for these ideas must be meaningful to the reader, and must be integrated with his own concepts (p. 61).

Gray's (1960) description of the reading process seemed most adequate for the purpose of this study. It appears to be broad enough to include the various types of reading done in social studies, yet takes into account the various components of reading. He goes beyond defining reading in a brief, concise statement. Instead he describes the reading process in terms of its major aspects and indicates the manner in which various reading skills are grouped under these four major aspects. He makes reference to the fact that the various aspects are closely inter-related and form a psychologically coherent unit.

The four major components are: (1) word perception, (2) comprehension, (3) reacting to what is read, and (4) fusing of new and old ideas.





Word perception involves the discrimination of one word form from others, the simultaneous association of word form, sound, and meaning. The rapid occurrence of this process depends largely on the development of clear memory images established through repetitive encounters with the same words. In some instances words are not in a person's sight vocabulary, making it necessary for him to have mastered word attack skills as aids in independent word perception. Such aids include use of context, phonics analysis, structural analysis, and dictionary skills.

The second major aspect of reading in Gray's model is comprehension. This includes three levels of understanding. The first, literal comprehension, or "reading the lines" involves getting the meaning actually stated by the words. The second level involves comprehending the expanded meaning or "reading between the lines". This involves getting meaning the author has intended to include, but has not stated in the words. Thus there is a "parallel flow of ideas, stimulated by, but not limited to the printed words (Gray, 1960, p. 13)." The third level, which is least restrictive of the three, is often termed "reading beyond the lines". This involves consideration of the "significance and implications of the author's ideas as contrasted with what he has said (Gray, 1960, p. 17)."

Successful reading at any level depends on the development of a number of attitudes and skills. Literal comprehension requires "an inquiring attitude toward the meaning of the passage, the arousal of meaning associations with words, and the fusing of separate meanings into a stream of ideas (Gray, 1960, p. 13)." As the reader follows the author's ideas, he notes the organization of them and is able to anticipate subsequent ideas.





Obtaining the expanded meaning also requires a number of attitudes and skills. This involves such things as sensing implied meanings, and making inquiries appropriate to the type of material read. The good reader brings his own related experience to the situation to enrich the meaning, but is careful to distinguish the author's ideas from his own. He also interprets the materials in light of the author's purpose, mood, and attitudes as well as the setting (time and place) (Gray, 1960, pp. 13-14).

The third level of comprehension involves "reading beyond the lines" or understanding the ideas read. A clear understanding of the author's message as well as his motivation, are necessary before the reader can consider the ideas and envision their implications and possible applications.

The third major aspect of reading is reacting to what is read. Such reactions can be automatic, or reflective (Gray, 1960, p. 17). The automatic reaction is that which occurs as the reader reads, that is, his initial feeling about the material he has read. The reflective aspect has to do with what is often termed "critical reading" or the evaluation of what is read.

Three requisites are required for good critical reading. These include: an attitude of inquiry, an adequate background as a basis for evaluation, and the ability to make sound judgments in evaluating what is read (Gray, 1960, pp. 18-19).

The fourth major aspect of reading is what Gray (1960, p. 19) refers to as assimilation. It involves the fusion of ideas acquired in reading with the ideas the reader already possesses as a result of his



experiential background. This fusion is made possible by the functioning of a number of mental processes, such as analysis, comparison, selection, synthesis, and judgment (Gray, 1960, p. 19). The assimilation of new ideas serves to clarify the reader's concepts or perhaps help correct inaccurate concepts, as well as to make possible new insights, broader interests and rational attitudes (Gray, 1960, p. 9).

Gray's model was selected as a model of reading for this study for several reasons. The first of these was that it presented a systematized view of a complex mental process. Such a situation makes it possible for a person to grasp a basic understanding of some of the important aspects of the reading process. It also provides a framework within which research projects can be located. Such a situation facilitates understanding of where a given study fits in the process of reading. Other models of reading may also provide such a framework, but the breadth of this model seemed to be suitable for the topic under study. Since this investigation was concerned with both the reading of words and maps, a model was required which could encompass both. Gray's model seemed to have this potential.

It has been recognized, however, that there are a number of limitations which must be acknowledged when using any model of the reading process. Any attempt to conceptualize a complex mental process such as reading leads to oversimplification because the components must be presented one at a time, whereas in actuality the components operate as a unified whole. Gray (1960, pp. 8-9) acknowledges the psychological unity of the reading process, but feels that a discussion of the components of the reading process is enhanced by concentrating on one component at a time. A second weakness which may be somewhat related



to the first is that Gray has depicted an "idealized" process of reading. It is doubtful that very many readers possess the skill (or perhaps the inclination) to progress through the process as it is described.

In social studies reading in particular, the process may break down at any point. The young child's reading process may terminate at the perceptual level. In social studies reading this may occur despite a reader's best efforts to employ word attack skills because of the multitude of specialized terms and names found in reference books. The presence of long, complex sentences may confuse the reader and prevent him from gaining a grasp of the meaning of the sentence. Thus the process would break down at this point. In other instances, the reader may comprehend the literal meaning of the discourse, but be unable to see the significance or implications of the ideas presented. This is especially true in social studies reading. The reader may be unable to react critically due to a lack of objective standards against which to judge the author's ideas. Even worse, he may react in a purely emotional way as the result of inaccurate preconceived ideas. Even if all of the previous steps are mastered, the reader may be unable to relate what he has learned from reading to his previously held ideas. He may in fact, distinguish between the ideas of social studies as a subject and his ideas concerning everyday living.

This idealized concept of the reading process does not take into account the fact that a reader may skip over certain levels or aspects of the process. For example, it is not unusual for a reader in social studies to grasp the author's message and fuse it with his own ideas without considering it critically. This accounts for much of the successful appeal of propaganda.





Perhaps the greatest limitation of the model, insofar as this study is concerned, is that it does not elaborate on the types of reading skills required in social studies. Certainly the basic reading skills which are discussed as a part of the model, such as the word attack skills, are a part of social studies reading. But there are a number of specialized skills required in social studies reading which are not mentioned. These include such things as the ability to handle specialized vocabulary, or to read graphic materials. This is understandable, in that the model is intended to present a generalized view of the reading process.

### III. READING IN SOCIAL STUDIES IN RELATION TO

#### GRAY'S MODEL OF READING

Although Gray's model has a number of limitations as far as reading in social studies is concerned, it does provide a good basis for a discussion of the relationship between narrative reading and reading in social studies. Gray is not very explicit concerning the relationship between his model of reading and reading in the content fields, such as social studies, but his model does provide enough scope to enable the establishment of such a relationship within its context. The four major aspects of reading would appear to be as relevant for reading in the area of social studies as they are for any other reading material.

For mature reading in social studies the ability to perceive words, comprehend meaning (on all three levels), react intelligently and critically to the author's ideas, and to fuse new ideas with those already held as a result of experience, seem to be necessary, or in fact essential. Therefore, reading in social studies does not differ from the





reading of other types of materials insofar as the major components of reading are concerned.

Word perception in social studies requires, in addition to the ability to use word attack skills such as phonics analysis, structural analysis, and use of context, a grasp of the technical or specialized vocabulary of social studies. Words such as "veto", "meridian" and "legislature" are examples of this type of vocabulary. Closely related to the technical vocabulary are the common words which have a specialized meaning in social studies. Huus (1963, p. 100) points out that children generally have some facility with words such as "branch", "cape", "source", and "range", but not with the meaning that fits the situation. The abundance of proper names in social studies reference material creates a real pronunciation problem for the child because many of the names are not linguistically regular. A major complicating factor is the fact that many of these names are derived from other languages and cultures (Moffatt & Howell, 1955, p. 275). Especially difficult are the abstract ideas represented by words such as "democracy" or "civilization". Words such as these have no clearly defined meaning, but must be understood gradually through experience with them in many contexts and situations (Bond & Wagner, 1960, p. 280).

The word attack skills are useful to a degree in identifying social studies vocabulary. But in many instances it seems that multiple encounters with the words in various contexts is the only means by which the student can master both pronunciation and meaning.

In comprehending what is read in social studies, the student must be capable of getting the main idea, drawing conclusions, making inferences, etc., just as he must in reading any other material. However, there are a



number of factors which make it difficult for him to do these things. The first has already been discussed, that is, vocabulary. If there are too many unknown words in a sentence, comprehension will obviously break down. Skill in reading the long, complex sentences often found in social studies texts is a necessity if comprehension is to be achieved (Wesley & Adams, 1952, p. 283). Such sentences reflect the complexity of the concepts and relationships which are basic to the social sciences. These would include such things as concepts of time, concepts of space, and cause and effect relationships. Bond and Wagner (1960, p. 283) express the view that the reduction of a complex sentence into two or more simple sentences might break the relationship between the ideas and make understanding more difficult. The following example illustrates this point: "The tide was in. The explorers could not search the beach for their lost equipment." These two simple sentences attempt to communicate a cause and effect relationship. However, the presence of such a relationship is clearer in a complex sentence: "Since the tide was in, the explorers could not search the beach for their lost equipment." The connective "since" not only prepares the reader to look for a relationship, but implies a particular type of relationship - cause and effect.

Accordingly, it is primarily the reader's responsibility to develop the skill required to read the complex sentences of social studies books. This can probably be done by gaining a broad experiential background which will enhance the development and refinement of concepts such as space and time, and through a study of the language, especially insofar as connectives are concerned.

Another factor which may cause difficulty in reading social studies





material is the use by authors of graphic materials to present information. Reading such materials requires the development of a number of specialized skills. In addition, information gained from such sources must be integrated with the written text to ensure complete understanding. In order to relate verbal and graphic materials together in a meaningful manner, it would appear that the reader must develop skills in addition to those required to read either the written discourse or the graphic materials as separate presentations. Therefore, in social studies reading, if either the map reading skills or the skills required to relate information gathered from maps and texts, are not sufficiently developed, the comprehension of important material might be inadequate.

The ability to react intelligently and critically to an author's ideas is very important in social studies. Gray (1960, p. 17) defines critical reading as " . . . the evaluation of what is read in the light of sound criteria or standards." These are: an attitude of inquiry or suspended judgment; an adequate background or basis for evaluation; and the ability on the part of the reader to make sound judgments in evaluating what is read.

These requisites are applicable to social studies as well as other types of reading. Certainly, an inquiring attitude is essential to ensure that students do not accept information just because it is in print. Such skills as the ability to distinguish fact from opinion, or to detect an author's biases would not function effectively if the reader did not have an attitude of inquiry.

Gray's second requisite, an adequate background or basis of evaluation, is also essential in social studies reading. If a reader does not have some knowledge concerning a particular topic, any attempt





he might make to distinguish fact from opinion or detect an author's bias would probably be inadequate.

However, an inquiring attitude and a sound basis for evaluation are not enough. The reader must be able to make sound judgments. According to Gray (1960, p. 19), this involves such things as selecting appropriate standards against which to judge specific items. In social studies reading, the reader may have adequate knowledge concerning a topic, but fail to apply it in judging the credibility of reading material.

Assimilation or the fusing of ideas acquired through reading with previous experiences represents Gray's last aspect of reading. The importance of the operation of this aspect in social studies reading seems obvious. If a student could not gain ideas from reading to clarify and extend his knowledge of social studies topics, he would be in a difficult situation. Wesley and Adams (1952, p. 273) stress this point when they state, "The ability to read is closely related to success in the social studies. The range of direct experience is sharply limited."

This study is concerned with the ability of students to read factual information from maps found in social studies reference books, and their ability to integrate this information with information from the written text. In terms of Gray's model, this study dealt with specialized reading skills which contribute to the literal comprehension of social studies discourse.

Although literal comprehension might be considered one of the lower or less complex levels of reading, its importance as a key component in the whole reading process should not be overlooked. Some authorities in the field of reading, such as Smith (1963, p. 265), caution teachers



against emphasis on literal comprehension to the exclusion of developing the skills necessary for the other levels of comprehension. However, she does acknowledge the importance of literal comprehension in the "curriculum areas of science, arithmetic, geography, and history (p. 276)."

Although Smith's warning should be heeded, at the same time there must be assurance that students have developed sufficient skills in literal comprehension. Such ability is not only important insofar as "getting the facts" is concerned, but as a basis for the development of the other levels of comprehension, and in turn, the other aspect of reading.

Failure to accurately comprehend exactly what the author has stated in words handicaps the reader in his efforts to achieve understanding of expanded meanings. In other words, if the reader cannot read the lines, he will have a great deal of difficulty reading "between the lines". Without an understanding of what the author has written, both explicitly and implicitly, the reader would be greatly hindered in "reflecting on the significance, relationships, implications, and applications of the ideas read (Gray, 1960, p. 17)."

A lack of facility in the comprehension aspect of reading would invariably affect the ability of the reader to react to what is read and to fuse the new ideas with the old. There would of course, be a reaction to what was read, but the quality of the reaction as far as objective evaluation is concerned would be questionable. It seems reasonable to assume that a reader must know what an author's ideas are before he can evaluate them properly. Similarly, with a proper grasp and evaluation of an author's ideas, the fusion of such ideas with those already held by the reader would contribute very little to, or perhaps impair the reader's





knowledge.

#### IV. MAP READING IN RELATION TO THE READING OF WORDS AND GRAY'S MODEL OF READING

Some of the skills which must be developed to ensure competence in reading social studies materials are involved in the ability to read and interpret maps. This section deals with the similarities and differences between map reading and the reading of words. Since Gray's model has been used to describe the reading process as it applies to printed discourse, this section also attempts to relate map reading to this model. The section concludes by pinpointing the type of map reading skills with which this study is concerned.

To begin with, there are two general ways in which map reading and the reading of words are similar. The first is that both types of reading are developmental in nature (Jarolimek, 1963, p. 187), (Wituki, 1962, p. 197). This means that the various skills involved cannot be mastered all at once, but their use must be accomplished through repeated exposure over a long period of time. Jarolimek (1963) sums up this situation by stating:

The importance of the gradual and continuous nature of the development of globe and map reading skills cannot be overemphasized. They are simply not taught once and for all time but are developed steadily and gradually throughout the child's school life (p. 197).

A second general similarity is the need for an adequate experiential background as a basis for meaningful reading. In map reading, as in any other type of reading, the reader must have abundant real and/or vicarious experience before the symbols used on a map can have meaning for him (Parker, 1933, pp. 12-13). Tiegs and Adams (1952, p. 281) note that





teachers of reading usually spend much time in building a background of common experiences for children. They stress the importance of the same approach in map reading.

More specific comparisons can also be made between map and word reading. There are many words on maps as well as a variety of other map symbols. Place names, the title, and the legend are found on nearly every map. Reading such words probably involves the same process as reading words in any other situation. However, the nature of the context within which the word is located is somewhat different for maps than written discourse. In reading a word that is within a verbal context, the pronunciation and meaning of the word can often be derived by means of clues provided by the context. Context clues are also present on maps, but in order to utilize them, the reader must be capable of understanding the context. Such things as a knowledge of the symbols that represent a river, a city, or a mountain range gives the map reader a clue as to the type of feature the name represents, even though he may not be able to pronounce the name.

In learning to read the specialized symbols used on maps, many authors, such as Jarolimek (1963, p. 170), feel that what is required is the learning of a special language. Although there are variations, the language of maps is relatively standardized in that cartographers employ a standard set of symbols. Some of these symbols include a direction finder, scale of miles, solid or broken lines to show divisions between states or countries, and irregular lines to show rivers (Tiegs & Adams, 1959, p. 277). As with words, there can be a great variation in the complexity of the ideas represented by map symbols. Some symbols represent concrete objects such as mountains or rivers, while others



represent rather abstract ideas such as political boundaries. Therefore, in addition to going back and forth between the words on a map which are part of one "language", and the non-verbal symbols which are essentially part of another "language", the reader must contend with variations in the degree of abstractness of the non-verbal symbols.

Since there are many ways in which map reading is similar to the reading of words, it seems reasonable to assume that this type of reading can be located within the context of Gray's model of reading. Instead of word perception, Gray's first aspect of reading, one could refer to map symbol perception. The process of perceiving map symbols is probably quite similar to perceiving sight words. Smith (1963, p. 171) uses this term to designate " . . . those words that children learn to recognize by sight without the aid of any of the other identification techniques . . . " What might be described as the map reading equivalents of word attack skills probably exist, but are more restricted in application. The average reader would likely attempt to pronounce an unknown place name by employing phonics analysis. The irregularity of many such names would detract from the effectiveness of this technique, however. The use of the map legend might be equated with the use of the dictionary, in that both provide definitions for symbols. As far as the legend explained the non-verbal symbols, it would be very valuable. However, in many instances the legend does not explain the meaning of some of the symbols used. Such things as irregular lines to represent rivers are symbols which cartographers use extensively, but rarely include in the legend. In such a situation, a knowledge of the context may help the map reader. If he could recognize the name associated with an irregular line and/or note that





the line connects with what he knows to be an ocean or lake; then it is probable that the meaning of the line would be apparent to him.

Insofar as comprehension is concerned, most authorities in map reading make distinctions between levels of comprehension for maps in much the same way that Gray has done for reading words. Lobeck's (1958, p. X) views are representative of such authorities:

Map reading is what all of us do when we want to find out where a place is on a map, or the distance between places . . . , or any simple geographical fact . . . . But map interpretation is like the process of reading between the lines of a story whereby the reader draws certain inferences and conclusions which the author did not specifically make.

The relationship between this and Gray's three levels of comprehension might be made clear by means of an example taken from Kennamer (1963, p. 149). An inexperienced map user may be able to read and comprehend (at the literal level) basic facts such as the location of a river and its tributaries. However, utilizing these facts, an experienced map reader might recognize a drainage basin. This seems to involve a second level of comprehension, which might be referred to in Gray's terms as "getting expanded meaning". In addition, the experienced map user might envision the significance and possible application of the ideas gained by recognizing the hydroelectric or flood control potential of the drainage basin under study. Such activities would appear to be very similar to Gray's third level of comprehension.

Gray's third aspect of reading involves reacting to what is read. The reader's automatic reactions to the ideas gained from a map probably depend on many of the same variables as his reaction to ideas gained from written discourse. According to Gray (1960, p. 17) these





include " . . . the reader's interests, background of experience, and his attitudes, biases, and preconceptions." For example, compare the reaction of a civil engineer to that of a duck hunter upon discovering a large swamp on the map of a particular area.

The fusion of new ideas with ideas gained from previous experience, Gray's fourth aspect of reading, also seems relevant to map reading. For example, it is conceivable that a reader might change his mind as to the route a highway should follow after viewing a map showing the features of an area.

This discussion of map reading in relation to the reading of words has been undertaken in an attempt to demonstrate the interrelationships and differences between the two. By relating map reading to Gray's model of reading, an attempt has been made to give a degree of structure to the reading of maps. Once this structure is established, it provides a framework in which to locate the particular aspect of map reading which is of importance in this study. This aspect is literal comprehension or the ability to read specific facts from a map in order to give a factual description of an area. The development of skill in reading maps at this level of comprehension is important for the same reasons that it is important in reading words. Without the ability to get the facts from maps, all other levels of comprehension would suffer. However, merely reading maps for facts should not be an end in itself, but a basis upon which to build the higher level interpretive skills.

## V. THE RELATIONSHIP BETWEEN MAP READING AND WORD READING IN SOCIAL STUDIES

Although there are many similarities between the processes



involved in map reading and reading written discourse, it should be noted that the two rely largely on different symbolic systems as their medium of communication. While it is true that many words appear in maps, a great deal of the information is represented by specialized map symbols which are non-verbal.

These differences, in and of themselves necessitate the development of skills in map reading. The ability to read written discourse simply does not prepare people to read maps adequately. However, the widespread use of maps within the context of social studies written discourse probably introduces a reading task in addition to the mastery of map reading skills. This would involve the ability to relate the information secured from the written text with that from the map. On the surface this sounds relatively simple, but there are probably both physical and mental difficulties inherent in such a situation.

There are the actual physical adjustments of moving the eyes from the written text to the map, trying to keep one's place in the text while reading the map, and then returning to the text. There is also the problem of adjusting to the changes in the direction pattern followed by the eyes. In reading printed word discourse, the eyes move along a line of print from left to right, and then make a return sweep from the end of one line to the beginning of the next. By the time a student has reached the sixth grade level, such a procedure has been habitual for a number of years. In reading a map, however, this pattern of eye movements is not appropriate. The eyes may move from the title at the top of a map to the legend at the bottom or either side, and then almost anywhere, depending on the type of map and the importance of various features on it. This adjustment in the direction pattern which is necessary when





looking back and forth between text and map may be a source of confusion for the reader.

At the same time, the reader must make adjustments as required by the symbolic system. He must leave the text from which he has been gaining information through the medium of the English language, utilize what amounts to another "language" to obtain information from the map, and next return to the language of the text. The fact that the map may include both verbal and non-verbal symbols may necessitate linguistic adjustments within the context of the map itself, as well as between the map and text.

In addition to making physical and linguistic adjustments after referring to a map, the reader must " . . . fit his newly found ideas into the total import of the paragraph (Smith, 1963, p. 346)." Therefore, it is a questionable procedure to assume that skill in reading written discourse and maps as separate entities ensures success in reading social studies materials in which they are combined.

It is precisely this situation which this study will attempt to examine.

## VI. READING AND THINKING

It becomes apparent while reading the previous description of the reading process that reading and thinking are very closely interrelated.

The nature of this relationship is not obvious, however, and as a result should be clarified. Two questions relevant to this discussion are: what do we mean by thinking and how does this relate to the process of reading?





### Schema for Thinking

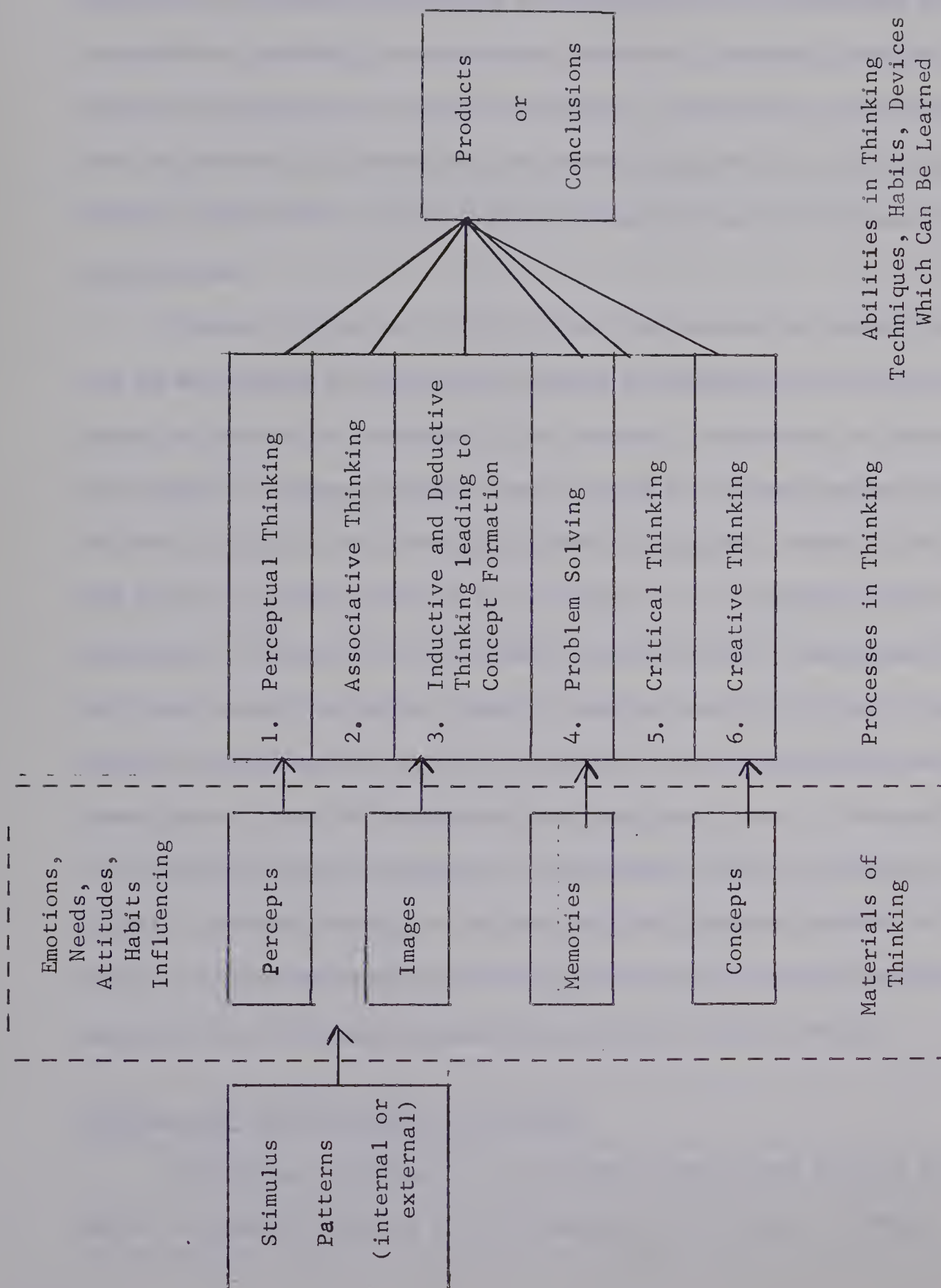
The term "thinking" is very ambiguous and has been used to refer to numerous types of activities in many different contexts (Vinacke, 1952, p. 2). For the purposes of this study, the schema used by Russell (1956, pp. 8-14) will be employed to provide a frame of reference for the discussion. Russell (1956, p. 8) contends that a systematic account of thinking cannot be worked out in unitary terms, but is best studied as a whole including four factors. A schematic representation of these factors appears in Figure 1.

As can be seen in the schematic representation, Russell (1956, p. 8) views thinking as including these four main factors:

1. The materials of thinking which include sensations, perceptions, memories, images, and concepts.
2. The motives for thinking which include such things as feelings, emotions, needs, attitudes, and habits of thought acquired earlier which help initiate and determine the direction of thinking.
3. Processes in thinking are patterns of activity, such as selecting, eliminating, searching, manipulating and organizing, which vary from relatively undirected thinking through inductive thinking to problem solving, critical thinking, and discovery.
4. Abilities in thinking are the habits, techniques, and guides to thinking which can be acquired and developed.

Two of these four factors will now be considered in some detail in connection with the reading process. While it is recognized that all four factors are interrelated and play a part in the reading process, the "materials" of thought and processes of thinking have been selected for





Abilities in Thinking  
Techniques, Habits, Devices  
Which Can Be Learned

Processes in Thinking

Materials of  
Thinking

FIGURE 1

SCHEMA FOR THINKING (FROM RUSSELL, 1956  
CHILDREN'S THINKING)



discussion in this paper. This discussion will not be in great detail, as that is beyond the scope of this work.

Russell (1956, pp. 10-14) contends that there are a number of processes of thinking which can be classified as: perceptual thinking, associative thinking, inductive and deductive thinking, problem solving, critical thinking, and creative thinking. Although he has separated them for the purpose of discussion, he acknowledges the fact that they are in reality inseparable as they are all integrated and part of an overall organization.

Russell (1956, pp. 17-18) feels that one way in which distinction can be made among the various processes of thinking is in terms of the amount of direction involved in the process. Direction is described as the degree to which a specific end or goal is actively sought. Perceptual thinking is the least directed process of thought. Associative thought may also be greatly affected by the state of the organism and/or external influences. Thus it is also relatively undirected. Conceptual thinking may be directed, but often toward a goal of which the child is unaware. Creative thinking and critical thinking are much more highly directed toward goals than the processes previously mentioned. The specific nature of the solution may be unknown to the person, but he is actively seeking a goal. Problem solving is the most highly directed process of thought. As in creative and critical thinking, the person actively seeks a solution, but the goal is more fixed within a narrow range.

#### Reading and the Processes in Thinking

Perceptual thinking is a relatively undirected type of thinking which is greatly affected by environmental influences. Russell (1956,





pp. 10-11) classifies it as a type of thought, however, because it does involve processes based on past experience and is directed to the degree that it discriminates between competing stimuli. It results from either internal or external stimulation. Reading involves perceptual thinking in that discriminations are made between words, which could be considered patterns of stimuli to which the reader reacts. Gray's word perception aspect probably involves this type of thinking process as well as others. Being able to see the word, distinguish it from other words, and put a label on it is within the realm of perceptual thought. Kress (1960, p. 51) contends that children who are excellent oral readers, but poor in comprehension may be doing a good job of perceptual thinking, possibly at the expense of more complex patterns of thought.

Social studies reading relies on adequate perceptual thinking, as does any other type of reading. The reader must be capable of organizing and interpreting the stimuli received if the reading process is to function. The patterns of stimuli provided by the technical vocabulary and proper names in social studies discourse may be difficult for the reader to organize and interpret because of a lack of familiarity with them.

The prevalence of maps and other graphic presentations of information may also be a source of difficulty for perceptual thinking. As with some of the printed verbal stimuli, a lack of familiarity with the non-verbal symbols used on maps may cause problems. In addition, making distinctions between figure and ground when reading a map may present difficulties not encountered when reading printed word discourse. Maps often use very small print, a variety of colors and/or shading, variations of broken and solid lines which have distinct meanings, and dots which



have minute but important differences. In many instances a massive amount of information is included in a single map. Accordingly, it is understandable that perceptual thinking may be difficult when maps are included in social studies reading materials.

After reviewing a number of theories concerning associative thinking, Russell (1956, p. 211) came to the conclusion that " . . . associative thinking is a rough term descriptive of much routine thinking of a sequential pattern." This type of thinking is relatively undirected, in that it is not directed toward a problem to be solved by means of a conscious effort of the child (Russell, 1956, p. 11). There are two types of associative thinking - free and controlled (Chaplin & Krawiec, 1960, p. 271). Free association involves the association or stringing together of ideas with no apparent sense of direction. This is a " . . . personal train of ideas largely directed by the wishes and needs of the child (Russell, 1956, p. 204)." Insofar as reading is concerned, this type of association is detrimental in that it interferes with the ideas which the author is trying to communicate. For successful reading, controlled association is essential. The child must associate the ideas in the discourse together in the same way as the author has done to ensure communication. The importance of this type of association for reading comprehension seems obvious. If the reader does not follow the author's ideas, comprehension is impossible. Although this type of thought is essential in reading, if other thought processes are not employed, the message received from the author will be a very literal one and the reading process terminated at that point.

In social studies reading, controlled association of the author's ideas is often a difficult task for the reader. A number of factors,





such as technical vocabulary, long and complex sentences, and the need to leave the text to read a map tend to break the continuity of reading and make controlled association difficult.

Inductive and deductive thinking are probably both involved in the reading process. Inductive thinking is the procedure by which concepts are formed (Leeper, 1951, p. 740). This process begins with varied experience and observation which provide a wealth of perceptual material from which certain features are distinguished and related to other features (Leeper, 1951, p. 740). This inductive concept formation involves discrimination, abstraction, and generalization (Russell, 1956, p. 248).

In securing an expanded meaning or reading "between the lines", this type of thought may be operative. By utilizing the literal information provided by the author and his own relevant related experience, the reader, through a process of inductive thought can arrive at implied meanings and generalizations concerning the author's attitudes and purposes. For example, individual words within a sentence may not, at the literal level, provide evidence of a critical attitude on the part of the author toward a given subject. However, by selecting the elements from several sentences or paragraphs which suggest such an attitude, and relating these to his own experience with situations of this type, the reader is able to arrive at a conclusion or generalization. Such a procedure appears to involve inductive thinking.

Inductive thinking is the thought process which enables a reader to utilize background information provided by previous experiences and factual information from social studies discourse to arrive at important social studies concepts. For example, by means of inductive thinking a reader could arrive at a concept of "desert" as a result of encounters





with specific examples of deserts. Such encounters might be made by means of a vicarious experience such as reading, or perhaps directly, by actually seeing a desert.

Deductive thinking, or deductive concept formation probably occurs very often in conjunction with inductive thinking (Russell, 1956, p. 12). Leeper (1951, p. 748) contends that deductive thinking is a very common process, although we often fail to realize this fact. He also notes that psychologically this process may not be strictly in accord with the requirements of logic because the premises upon which the process is based are not well established, thus are really hypotheses (Leeper, 1951, p. 748).

In reading printed word discourse, it is conceivable that such a process is utilized by the reader in arriving at the implications of an author's ideas. However, the reader can gain considerable information from discourse even if he does not engage in this type of mental activity, and some types of discourse do not require deductive thinking for total communication. Map reading is different, however. In order to gain much of this information, the reader must make deductions. This may be a factor which contributes to the difficulty many students have in reading maps.

Russell (1956, p. 12) regards problem solving as the most directed of the thinking processes. In a problematic situation, the individual encounters a situation for which he has no immediate solution. But a problematic situation for one individual may not be for another. There are great individual variations in the background information, experience, and motivation that people bring to situations (Russell, 1956, p. 252). In fact, some individuals may be so lacking in these respects that they



cannot even comprehend the problem. In such instances, the problem does not exist for that individual. The situation is a "puzzle" not a problem (Russell, 1956, p. 251). Problem solving, according to Vinacke (1952) is more concerned with conditions in the external world than other thinking processes. Thus " . . . in problem situations, the normal person is behaving . . . in relation to the demands made by the external conditions . . . (Vinacke, 1952, p. 160)." A number of authors, starting with Dewey in 1910, have formulated steps in problem solving. Russell (1956, p. 12) suggests that each problematic situation is characterized by: the recognition of the problem; by assembling the facts related to it; and some conclusion concerning the best course of action to be taken.

The interrelationship between reading and thinking can probably be readily demonstrated in terms of the problem solving process. The process of reading itself can present students with problems. The inability to recognize a word by sight or to understand an author's point on first reading may be considered problematic situations. Although such problems vary in complexity and differ in degree for different people, they probably require this type of thought process. However, the reading process can also be an integral factor in assisting problem solving. Reading is one way in which relevant information can be assembled in an attempt to solve problems. Thus the relationship between reading and problem solving is varied and complex.

In social studies reading the relationship between reading and problem solving is especially apparent. Difficult vocabulary, long, complex sentences, and the presence of graphic materials are some of the features of social studies reading materials which require an active





process of problem solving on the part of the reader. Social studies is often organized around a problems' approach in which the students deal with problems arising from universal human needs such as getting and preparing food, and providing shelter. In this type of arrangement, reading is indispensable as a means of assembling information.

The next thinking process with Russell's classification is critical thinking. He acknowledges its presence as a part of both problem solving and creative thinking, but feels it may have some importance in its own right (Russell, 1956, p. 13). Critical thinking can be defined as:

. . . the process of examining both concrete and verbal materials in the light of related objective evidence, comparing the object or statement with some norm or standard, and concluding or acting upon the judgment made (Russell, 1956, p. 301).

This definition presupposes a knowledge of a particular field. This seems to be a reasonable supposition, in that a person cannot be critical in the proper sense of the term without such knowledge (Russell, 1956, p. 283). In addition, it implies the need for a general habit of suspended judgment, the need to make logical comparisons (Russell, 1956, p. 283).

The model of reading as conceived by Gray, has as its third major aspect, reacting to what is read. Gray's (1960, pp. 17-19) account of this aspect of the reading process is very similar to the account of critical thinking presented by Russell (1956, pp. 281-303). The three requisites for this aspect of reading are designated as: an attitude of inquiry; an adequate background or basis for evaluation; and the ability to make sound judgments in evaluating what is read (Gray, 1956, pp. 17-19). In essence, insofar as Gray's concept can be designated as reading and Russell's schema as the processes of thinking, at this point reading and thinking become the same process. It is true, however, that the process





of critical thinking has wider application than to just ideas derived from reading.

Regardless of whether the process is designated as critical reading or critical thinking, its functioning in social studies reading is extremely important. Smith (1963, pp. 348-349) includes critical reading as one of the important skills required for successful reading in social studies. Students, today, are subjected to the steady pressure from mass media; therefore, it is essential that they learn to reject or accept with reservation much of the material the mass media present.

Students should be made aware of the fact that maps, as well as other graphic devices, can be used to deceive. For example, a map produced in China showing its southern boundary might be quite different than that produced in India. Blotches of bright color on an otherwise black and white map might produce an effect in the reader's mind all out of proportion to the actual significance of the situation depicted on the map.

The last of the processes of thought which Russell discusses is creative thinking. Russell (1956, p. 13) regards the occurrence of a somewhat unique solution to a problem as being the result of the operation of this process. Gray (1960, p. 19) regards creative thinking as an integral part of the reading process. Kress (1960, p. 53), in discussing the relationship between reading and creative thinking, stresses the importance of well developed reading skills as tools to provide new experiences to enhance the likelihood of the occurrence of creative thought.

This line of thought seems to be as relevant for social studies reading as for any other type. If the student is to think creatively



concerning situations encountered in social studies reading, he must have extensive background information. One way to acquire such a background is through wide reading, which in turn depends on well developed reading skills.

The relationship between the reading and thinking processes should not be considered exclusive. Although the previous discussion relates only one or two of the thinking processes to a particular aspect of reading, this does not imply that other thinking processes are not involved. The relationships referred to are merely illustrations to suggest the close interrelationship between reading and thinking.

#### Reading and the Materials of Thinking

Russell (1956, p. 65) also makes reference to the "materials of thought" as distinct from the processes of thought which have just been discussed. The most important of these "materials" are concepts. But concepts do not arise in the absence of some type of experience; therefore, the other "materials" of thought are important as the basis from which concepts are formed. The general pattern of development according to Russell (1956, pp. 65-66) is as follows:

. . . percepts grow out of sensations resulting from environmental stimuli. They may be recalled at some later time in the form of images or memories. In turn, percepts, sometimes accompanied by images and often by memories develop into understandings and generalizations in the form of verbalized concepts.

Although Vinacke (1952, p. 120) would generally agree with this account of the manner in which concepts are formed, he would restrict this primarily to children's thought. Although adults are capable of this type of concept formation, in most instances they form new concepts by reorganizing the components of their concept systems in new ways





in relation to new stimuli (Vinacke, 1952, p. 120).

This process of manipulating concepts is facilitated by the use of language. Giving a concept a symbolic label enables a person to manipulate concepts in many complex ways. In other words, the concept can be detached from a given situation by means of a word and used to organize experience (Vinacke, 1952, p. 106). In addition, this arrangement makes possible communication between people having similar concepts, represented by the same symbolic system. Vinacke (1952, p. 100) emphasizes the point, however, that words are merely labels which stand for concepts, not the concepts themselves.

The use of symbolic labels, such as words, does not necessarily reflect the presence of a concept which is accurate in the objective sense of the term. This can be explained in terms of the variation in consistency or correctness in the organization of concepts (Vinacke, 1952, p. 102).

The importance of concepts in thinking is recognized by nearly all psychologists. Russell (1956, p. 122) contends that:

. . . it seems difficult to overestimate the importance of concepts in any thinking done by children or adults. More than anything else they are the premises, the foundations, and the structural steel of thinking.

Insofar as reading is concerned, the importance of concepts is paramount. Kress (1960, p. 50) stresses the fact that communication by means of reading, writing, speaking, or listening depends on the similarity of the concepts and language symbols of the people involved. Carroll (1967, p. 226) observes that even slight differences in the concepts of two people can lead to misunderstanding in spite of the fact that the concepts may have many shared elements. This is probably one of





the reasons why children have difficulty in reading in the content areas, such as social studies. In many instances they have simply not had the experience required as a basis for developing many of the concepts which are necessary in order to understand the communication. In addition, the presence of graphic materials such as maps necessitates the development of a number of concepts to ensure understanding. These would include such things as concepts of direction, scale, and a reference system.

## VII. SUMMARY

This chapter has attempted to provide a theoretical framework in order to give the reader an understanding of the author's view of the reading process, and where the student fits into this process when reading social studies material. In addition, the importance of thinking in relation to reading has been discussed.

Gray's model of reading has been used as a conceptual model of the reading process. According to this model, reading consists of four major aspects: word recognition; comprehension; reaction to what is read; and the fusion of new ideas with those previously held. Such a division of the reading process is admittedly artificial, but it makes possible a systematic discussion of reading.

Gray's model seems to be capable of encompassing all types of reading, regardless of the subject field. For example, social studies reading probably involves all of the aspects of reading previously listed, but differs in the skills required to achieve these aspects.

This study is concerned with some of the special skills required for reading in social studies at the literal comprehension level. These skills are the ability to read factual information from maps and the



ability to relate this factual material to that derived from a written text.

Reading and thinking are obviously interrelated. The model of thinking devised by Russell has been employed to give a degree of clarity to the discussion. As with Gray's model, this one has limitations as well. When a dynamic process is divided into components for the purpose of discussion, the result is an oversimplification. The various processes of thought which include: perceptual thinking; associative thinking; inductive and deductive thinking; problem solving; critical thinking; and creative thinking are probably all operative in most of the aspects of reading. However, some of them can be discerned more readily than others in particular aspects.

In addition to the processes of thought, the materials of thinking are of importance. The most important of these are the concepts based on abstractions from perceptual data, which in turn is dependent on experience. Concepts can be represented by words, making communication between individuals with similar concepts possible. Therefore, it is necessary for the reader to have concepts similar to the author to ensure communication between the two.





## CHAPTER III

### RELATED LITERATURE

#### I. INTRODUCTION

This study is concerned with the ability of children at the sixth grade level to utilize information presented in their social studies reference books. In attempting to read such books, the student encounters a number of maps which are related to the word text in various ways. It seems reasonable to predict that these maps may present a reading obstacle to the student in that a number of specialized skills are required to read a map. In addition, it seems probable that still other specialized skills are required to enable the student to relate what he has read from the map to the written text.

Jefferson (1959, p. 118) contended that building the relationship between graphic materials and the written text is a two step process. The first step involves mastery of the skills required for reading the particular type of graphic presentation. Making a connection between the graphic material and the word text is the second step.

On this basis, the chapter will be divided into two major sections. The first section will be a review of the literature related to the ability of students to read maps. The second section will review literature concerning the relationship of map and text reading. Each major section will present the views expressed by educators, as well as a review of research studies.





## II. LITERATURE RELATED TO MAP READING

The studies in this section will be discussed to seek answers to three basic questions. These questions are:

1. What map reading skills are grade six children capable of using?
2. Historically, what have studies shown insofar as the effectiveness of map reading programs is concerned?
3. Has direct teaching improved the map reading skills of students?

These are probably not discrete questions in that answering one often provides at a least a partial answer for one or both of the others.

The need for at least a tentative answer to these questions is very important in this study. If children in grade six cannot read maps, in spite of specialized training, it would be entirely unrealistic to expect them to be able to read maps in a reference book and relate the information to the printed text. In other words, if they do not have the first set of skills, that is, map reading, it is fruitless to investigate the second set of skills, which involve the ability to relate a map and text.

### The Opinions of Educators

The material included in this section represents the views of people involved in a number of different areas of education. The opinions of university professors, school administrators and classroom teachers have been included, as all of them probably have a contribution to make. For example, the opinions of classroom teachers are considered valuable because many of them have had a great deal of experience working with children. As a result, they have probably acquired a "working



knowledge" of the capabilities of students.

Shyrock (1939, pp. 181-187) presents her view of the map skills students can be taught at the various grade levels, from grade three through college. In her estimation, with proper instruction, the grade six child is capable not only of reading a map for basic information such as the location of a place or the distance between two cities, but of mastering a number of rather complex interpretive skills.

Trail (1952, pp. 238-244) feels that a sequential program to develop map reading ability is important. He stresses the need for map readiness in the primary grades, but feels that all grades have a responsibility for the program. He implies that children in the upper elementary grades are capable of reading maps by stressing the responsibility of the teachers at these grade levels to teach map reading skills.

Kohn (1953, pp. 146-147) contends that a student can interpret maps only insofar as he is able to:

1. Orient the map and note directions.
2. Recognize the scale of a map and compute distances.
3. Locate places on maps and globes by means of grid systems.
4. Recognize and express relative locations.
5. Read symbols and look through maps to see the realities for which the symbols stand.
6. Integrate patterns that appear on maps and make inferences concerning the association of people and things in particular areas.

Kohn (1953, p. 75) outlines a program which includes the type of skills applicable at various grade levels. For intermediate grades, that is, grades four to six, he feels that instruction in all the skills listed above is suitable. Therefore, although he suggests that the





program outlined is tentative, it would appear that he expects students at the end of elementary school to be capable of utilizing most of the skills required in map reading.

Thralls (1958) outlines a number of skills which must be developed by children to read and interpret maps. He suggests grade levels at which the various skills should be developed. By the time students complete the sixth grade, Thralls (1958, p. 55) feels that their understanding and appreciation of the value of maps as a learning tool should be at a fairly high level. This would include skill in utilizing such things as: scale of miles; legend; and a grid system consisting of lines of latitude and longitude for locating places.

Whipple (1959, pp. 63-64) discusses the map learnings that should be undertaken at various grade levels. She emphasizes the importance of a readiness program in the primary grades and recommends the fourth and fifth grades as times to develop skill with various map concepts such as scale, symbol recognition, latitudes, direction, etc. Therefore, it seems reasonable to assume that Whipple would expect students to be able to read maps with competence after completing elementary school.

In discussing the geography that a child of twelve can be expected to understand, Garnett (1960, pp. 34-38) contends that children in junior school can and should be taught what she terms essential "tool knowledge" for the study of geography. Subsequent chapters of her book reveal that "tool knowledge" includes, among other things, the ability to read map symbols; locate places by means of a grid system; orient a map and note direction; and use the scale.

Sabaroff (1961, pp. 184-190) feels that pupils should have a mastery of five basic skills if they are to employ maps as useful tools



of learning. These skills include:

1. Location, including orientation and direction.
2. A knowledge of symbols, both physical and cultural.
3. An understanding of scale.
4. An awareness of relative location.
5. Recognition of the globe as a model of the earth.

Implicit in her discussion of these skills are the assumptions that children are capable of gaining some understanding of and facility with these basic skills, even in the primary grades, and that this understanding and facility can be developed through careful instruction. Although she refers only to the "early grades" in her article, the assumption that she would believe grade six students to be capable of effectively utilizing such skills in reading maps seems justifiable.

As part of an investigation for a doctoral dissertation, Casper (1961, pp. 53-58) sought to determine the types and extent of geographic skills a group of experienced educators would consider appropriate for grades four through twelve.

The 266 teachers selected had, as a group, rather impressive credentials. They were designated as competent educators in the field of geographic education by State Commissioners of Education, City School Superintendents, and professional geographers. As a group, they were well trained. Doctor's degrees were held by 6.69 per cent, master's degrees by 53.4 per cent of them, and bachelor's degrees by 37.4 per cent of the group. In addition to their training in education, they had an average of 28.5 semester hours of geography. They were also very experienced, with an average of 19.2 years of experience for the group. The individuals who comprised the group represented 149 city schools in 44 states, the





District of Columbia, and 5 Canadian provinces. Among other things, the questionnaire revealed reluctance on the part of teachers to make definite commitments in placing individual concepts at particular grade levels. However, the large majority placed the developmental skills involved in using geographic tools at the fifth, sixth, and seventh grades. They did feel, however, that fourth graders were capable of understanding map indices, keys, symbols, route maps, and locational devices such as circles, tropics, and the equator. The teachers were quite emphatic concerning the ability of students to formulate and use relationships from the facts read from a map. They felt this was beyond the capabilities of children below the sixth grade level, and only possible to a limited extent in grade six.

Wituki (1962, pp. 196-205) indicates that children in the middle grades have the capacity to understand most of the map reading skills. More specifically, she lists the following skills as those that should be reviewed or at least introduced in grades four to six:

1. The use of symbols.
2. The use of the map key.
3. The use of maps to understand climate.
4. The meaning of parallels and their use.
5. Understanding of simple scale.
6. Ability to learn from maps about the location and distribution of natural and man-made things.

### Summary

Generally speaking, in the opinion of educators, ranging from college professors to classroom teachers, by the end of the sixth grade,





pupils are capable of utilizing many of the fundamental map reading skills. Such skills would include:

1. The ability to orient a map and note directions.
2. An understanding of scale and the ability to compute distances between two places.
3. The ability to read the map legend.
4. The ability to understand map symbols.
5. The ability to locate places in relation to other features shown on the map.

However, there is some disagreement concerning the ability of the average grade six student insofar as the use of a full-fledged grid system is concerned.

#### Research Studies on Children's Map Reading Skills

While the opinions of educators concerning the capabilities of children are important and should be noted, research studies provide a more objective assessment of the map reading abilities of children and the effects of programs designed to improve these skills.

A study by Thorp (1933) assessed how well students were using various geographic tools. Her sample included 556 students in grades four to eight, ranging in age from nine to fourteen years. One of the grade six classes was given regular instruction in the use of geographic tools for a period of six weeks prior to the time of testing. She conducted a series of tests covering various aspects of geography, but Test Two, the Map Reading Test, is the one of concern here. Her findings were presented in tabular form as the percentage of the group at each grade level that gave satisfactory answers. In all instances,

The first of these is the fact that the  
government has been unable to

bring about a general improvement in

the position of the working class.

The second is the fact that the

government has been unable to

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the position of the working class.

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the experimental grade six group was superior, followed by each of the grade level control groups from grade eight to four in order. The significance of the differences between groups, is unknown however, as the figures were not subjected to statistical analysis. On the basis of her findings, the author concluded that incidental teaching of the proper usage of geographic tools had failed. She also concluded that the use of the geographic tools studied was within the competence of the average grade six student.

The results of this study can only be considered as suggestive, as the study contained a number of inadequacies. The first of these is the inadequate experimental design. In fact, according to Campbell and Stanley (1967, p. 12) the design used is a pre-experimental design which they designate the "Static Group Comparison." In this type of comparison, there is no way of being sure that the experimental group would not have differed from the control groups regardless of the treatment. Since Thorp's groups were at varying grade levels, and the basis upon which the experimental class was selected is not given, this weakness in design becomes apparent to the educational researcher.

A second weakness concerns the testing instrument used. Since no data on the reliability or validity of the instrument is given, one cannot assume that the instruments are acceptable. In any case, this study demonstrates an awareness of the need for teaching map reading skills and suggests the possibility that the average grade six student can learn to use the basic map reading skills.

A second study, also reported in 1933, was conducted by Howe (1933). He attempted to measure the ability of grades four, five and six students to use map symbols. In addition, he tried to test the





effects of a remedial map reading program.

His sample contained 455 students which included 99 fourth grade students, 206 fifth grade students, and 150 sixth grade students. The testing instrument was made up of five maps followed by questions which required the ability to: read and apply symbols; understand unwritten symbols such as a map grid; read direction; use the scale to establish mileage; and read inscriptions on the face of the map.

The findings were presented in tables, showing the percentage of each group that answered the different questions correctly. The investigator felt that the low percentage of correct answers in the major portion of the test was a clear indication of a lack of skill in map reading on the part of the subjects.

To remedy this situation, the students were given remedial work; then retested with the same test. The period of time that this work was given was not reported. The investigator contended that the number of correct answers on the retest showed material gain on practically every question. As a result, he concluded that careful teaching of the average elementary school child will improve his ability to read information from a map.

This study has a number of weaknesses which detract from the value of its findings. First, no statistical analysis had been used to determine whether or not the scores on the second test were significantly greater than those on the first, or merely a matter of chance. Second, the One Group Pretest-Posttest Design (Campbell & Stanley, 1967, p. 7) is vulnerable to a number of confounding extraneous variables. Any gain in mean score may be due to history. This means that other change-producing events may have occurred in addition to the remedial program. It is also



possible that its practice effect of testing accounted for the gain, or a portion of it. This seems all the more likely since the same test was used for both pretest and posttest. Since these weaknesses are evident, it is difficult to accept the author's conclusions. However, in spite of its weaknesses, the study can be considered suggestive, in that it is generally consistent with the findings of other studies in this area.

A study reported by Howell (1950) had as its purpose the assessment of the effects of a year's intensive work on work study skills, which included map reading abilities. The investigation involved 264 students in grades four to eight within a single school in Elmira, New York. There were two classes at each grade level, approximately equal in size. They had been divided into two groups - "fast" and "slow" on the basis of I.Q. scores, achievement tests, and teacher opinion.

In March 1948, all of the students were given the Iowa Every-Pupil Tests of Basic Skills, Form O. This test contains a section on work study skills, Part I of which is Map Reading. The results were compiled in terms of the average grade equivalent for each class. Units of work were developed for the study skills, and the units were integrated within appropriate subject areas. The unit on map reading had as its objectives: the ability to read directions correctly; to recognize and interpret standard map symbols; use the key; use a grid system; apply physical facts to a map situation; and read and interpret facts from maps.

A year later, in 1949, the students who had been in the fast group in each grade in 1948, were in the fast group in the next higher grade. The situation was the same for the slow groups. The students were retested, using an alternate form of the Iowa Every-Pupil Tests of Basic Skills. The results indicated that when the mean grade equivalent for





each of the groups was compared with their mean grade equivalent of a year earlier, there were in many instances, substantial gains as compared with the group used in establishing test norms. A number of the gains were in excess of two grade equivalents, others were in excess of one grade level equivalent. The only group that did not show such a gain was the slow grade seven group (1948) that had become the slow grade eight group (1949). They gained only .5 of a grade equivalent in a year.

The results seem to indicate such a program can be of value in improving map reading skills. The investigator recommended that intensive work on such skills should be started at least in grade four, as the greatest improvements in the study appeared in the intermediate grades.

In a study conducted in Syracuse, New York, Wagner (1953) attempted to measure the map reading abilities of grade six students. First, she compiled a list of map reading skills that are taught in elementary school, and then constructed a test based on this list of skills. This list included the ability to read a key or legend as a means of identifying various natural and cultural features; to use a scale of miles to determine distances between two places; the ability to use knowledge of the globe in recognizing distortions in areas and shapes shown on flat maps; the ability to locate places by means of a grid system; and to recognize directions on the various types of maps and globes.

The investigator attempted to get a sample which was representative of all the segments of the city's population. From the tests given she randomly selected one hundred papers for analysis. The results indicated a wide range in the ability of these students to read maps. The average per cent of correct responses for the entire test was 64. Since 62 per





cent of the answers involving the use of the scale of miles were correct, the author contended that the students had a degree of familiarity with scale, but were often inaccurate in its application. The ability of students to use the legend to interpret symbols varied according to the symbols. The children had a good command of symbols taught in earlier grades, but had trouble with things like dots which represented a given number of people. This group indicated that they had a better grasp of knowledge of the globe than any other type of map. Only about half of the questions involving the use of a grid system were properly answered, indicating a basic knowledge of the skill, but a general weakness in using it accurately. The pupils did well on questions concerning directions if the map was a Mercator projection and had north at the top. However, on maps which varied from this arrangement, less than half of the questions were answered correctly.

The investigator concluded the average of 64 per cent of correct answers was satisfactory in that a number of skills tested had not been introduced until the sixth grade. However, she did not report the time of year in which her test was given. Those skills which had been introduced in earlier grades showed higher per cents of correct answers. This study would appear to be indicative of the value of a developmental map reading program. It also points out the majority of elementary school students are able to use such skills when they are given sufficient practice.

Rushdooney (1963) conducted an experimental study with third grade students to determine whether or not they could learn map reading skills usually taught in grades four and five.

A representative sample of 129 third grade children was drawn from



the schools of a West Coast City, and randomly assigned to two groups. Initial measures of intelligence and general reading ability indicated there were no significant differences between the mean scores of the experimental and control groups. In addition, both groups were given the Map Reading section of the Iowa Tests of Basic Skills and their responses subjected to an item analysis. The results indicated that the children in both groups made similar responses to items on the test.

After initial testing, the experimental group was instructed in map reading skills usually taught in grades four and five. The instruction was given for fifteen weeks at ninety minutes per week. The control group was given instruction as outlined for grade three by the local system.

Both groups were given an alternate form of the Iowa Tests of Basic Skills when the fifteen weeks had elapsed. The findings indicated that the experimental group scored at a significantly higher ( $p < .01$ ) level than the control group. The experimental group was better on nearly all the items. Notable differences were on items pertaining to: direction from orientation; use of key and standard symbols; determining and comparing distances; and reading road signs and determining routes of travel.

The author concluded that the study demonstrated that third grade children are capable of learning many of the map reading skills usually taught in grades four and five.

This study helps to clarify the type of map skills elementary school children are capable of utilizing. If grade three students can learn to use many of the skills that are usually taught at the fourth and fifth grade levels, it does not seem unrealistic to expect that by the end of grade six, students should be capable of using most of the map reading skills.





McAulay (1964) conducted a study with fourth grade children to determine:

1. Their ability to learn map reading skills early in the year.
2. Whether or not the use of maps is more effective in aiding understanding of social studies content than other reading materials.
3. The extent to which particular map reading skills can be learned in conjunction with a social studies unit.
4. Whether or not map knowledge is facilitated by travel and mass media.

Two classes of grade four students were used in the study. They were very similar in terms of number of students, mean I.Q., chronological age of the students, and teaching experience of the teacher.

Both classes were given the section of the California Test in Social Studies, Form AA related to geographic understanding before instruction on a selected unit, and Form BB of the same test after instruction was complete.

The experiment was carried on for eight weeks. Both classes studied a unit on Pennsylvania. Class A had a globe and wall map available, but in general no effort was made to utilize maps in teaching the unit. Class B used maps extensively and each child completed fifteen to twenty map projects. These projects included work with cardinal directions, latitude and longitude, scale of miles, and various cultural and natural features of the state.

Near the beginning of the study, the parents of the subjects were asked to complete a questionnaire to determine the degree to which the children were exposed to geographic information in the home and community environment. The results indicated that the children in class A, as a



group, had greater opportunity in this regard.

The retest with the California Test of Social Studies, Form BB indicated that class B's mean was significantly higher than class A's at the .01 level of confidence. In addition, three other tests revealed differences in favour of class B at the same level of significance. The tests were concerned with geographic place information on Pennsylvania, general knowledge of Pennsylvania, and the ability to secure social studies information from a map.

The investigator concluded that:

1. Fourth grade students are capable of learning to use map skills early in the school year.
2. Maps can effectively and efficiently aid students in learning social studies content.
3. Fourth grade students can acquire map skills in conjunction with an ongoing social studies unit.
4. Map knowledge acquired in the home and community environment must be directed and coordinated with the social studies program to be effective.

The findings of this study provide further evidence as to the capabilities of elementary school students insofar as map reading skills are concerned.

### Summary

The studies reviewed in this section seemed to indicate that in general, by the time students finish elementary school they are capable of using what might be termed the "basic" map reading skills. These include using the map legend; reading direction from a map; using the



scale of miles; and some understanding of the use of a grid system or at least of parallels for locating places. A number of the studies demonstrated that such is not always the case, but that attention given to these skills by the teachers may result in improved skill development.

### III. LITERATURE RELATED TO MAP AND TEXT READING

The ability to read a map within the context of a social studies reference book probably requires reading skills in addition to those required for reading maps and printed texts as separate entities. Research on this problem is difficult to find, although some writers do express opinions concerning the demands made on the reader by this situation. This section is divided into two parts. The first deals with the views expressed by writers concerned with this subject, the second with research studies.

#### The Opinions of Educators

Smith (1963) discusses the difficulties encountered in reading geographic material. She points out that the reader must not only grasp rather detailed information from the text, but frequently leave the printed discourse to examine a map or picture. Such an examination necessitates the utilization of a required set of skills. The reader must then return to the proper place in the text and integrate the information obtained from the graphic presentation with the ongoing thought of the paragraph.

Dallolio (1959) contends that the ability to make referrals to maps or other graphic materials while reading a text requires a great deal of practice. The reader must not only find the map and study it,





but relocate his point of departure from the printed text. The situation is further complicated by the fact that many texts with geographic content contain on a single page, as many as eight references to maps which are on other pages. Such a situation tends to break up the continuity of reading and detract from its interest.

Jefferson (1959) speculated as to the skills that must be developed in order for a reader to successfully relate graphic materials to the written discourse in a text. She felt that developing such skill was a two step process. First, the reader must learn how to read the various graphic materials. Once this has been accomplished, relating the graphic presentation to the written discourse is the next step. Therefore, the ability to read graphic materials does not imply ability to relate such material to the printed text. Jefferson also cautioned people against assuming that skill in relating one type of graphic material to the printed text implied the ability to do so with other types of graphic material.

Whipple (1959) stated that many students depend largely on the written text in their books and often skip over maps without a glance. She also contended that tests of children who had completed elementary school support this view, for they show that many pupils lack skill in correlating information gained from the written text with that from maps. However, Whipple did not elaborate as to which tests had been given by whom to demonstrate this fact.

### Research Evidence

Actual research evidence concerning this problem is lacking. However, a study by Collings (1954) bears directly on this topic. His



subjects were grade eight students. Their task was to interpret data on maps after reading an accompanying written passage. The study demonstrated that the relationships involved in map word text reading require specific skills. These skills are not acquired through incidental use, but definite teaching yields large returns.

Robinson (1965) conducted a study which may be related to the problem under discussion. However, it must be considered as purely suggestive due to its very small sample. The purpose of the study was to discover what reading skills a group of bright grade four children (average I.Q. 127) actually used in solving social studies problems. The findings indicated that they used a number of reading skills with varying degrees of success, but 75 per cent of the group did not employ pictorial aids in finding the necessary information. This study seems to suggest that even bright children do not readily relate pictorial information with that derived from other sources while reading to solve a problem.

In a study in England, Vernon (1950) attempted to assess the relative effectiveness of various ways of presenting information in graphs and a written text. Sixteen grammar school girls, aged fifteen to seventeen and one-half, were divided into three groups. Three series of charts presented information in graphs and a corresponding written text. The first group read the texts of Series I first; then studied the charts simultaneously; studied the charts of Series III first, and then read the texts afterwards. The other two groups were rotated in such a way that each series was seen in each of the possible arrangements by an approximately equal number of students.

After each presentation oral questions were asked in order to test the subjects' grasp of the information which had been presented.





The results indicated no significant differences in the effectiveness of the types of presentation. Vernon (1950) observed that many of the subjects read the text and chart separately even when they were provided at the same time.

Although Vernon admits that this experiment offers no definite evidence concerning the value of presenting graphic materials with a printed text, she does do some speculating concerning this problem. She contends that information presented in graphic form is helpful only if the reader can integrate it with the line of thought in the written text. She feels that individuals, such as university students, have learned to do this by experience, but that for others it is a source of confusion.

Vernon (1953) reported two studies in the same article which dealt with the value of pictures in conjunction with a written text. She attempted to find out whether pictures facilitate or hinder the acquisition of information from a printed text.

In the first study, the subjects were fourteen boys and twenty-four girls from grammar schools. The boys ranged in age from seventeen and a half to eighteen; the girls from sixteen to seventeen and a half.

The results of this study indicated that there was no significant difference in the ability of the subjects to recall orally factual information presented in a written text with or without pictures. However, in spite of Vernon's terminology, this study did not really compare a purely written presentation of information with a written text accompanied by a picture. What Vernon referred to as a written text or non-pictorial presentation, was in fact a written text accompanied by a graph. Therefore, the comparison made was actually between the value of a picture as compared with a graph as graphic aids to accompany a

The first part of the paper is devoted to a general discussion of the problem of the existence of a solution of the system of equations (1) and (2) under the assumption that the functions  $f$  and  $g$  are continuous and satisfy certain conditions. In the second part, the existence of a solution is proved for the case when the functions  $f$  and  $g$  are piecewise continuous and satisfy certain conditions.

In the third part, the existence of a solution is proved for the case when the functions  $f$  and  $g$  are continuous and satisfy certain conditions. In the fourth part, the existence of a solution is proved for the case when the functions  $f$  and  $g$  are piecewise continuous and satisfy certain conditions. In the fifth part, the existence of a solution is proved for the case when the functions  $f$  and  $g$  are continuous and satisfy certain conditions. In the sixth part, the existence of a solution is proved for the case when the functions  $f$  and  $g$  are piecewise continuous and satisfy certain conditions. In the seventh part, the existence of a solution is proved for the case when the functions  $f$  and  $g$  are continuous and satisfy certain conditions. In the eighth part, the existence of a solution is proved for the case when the functions  $f$  and  $g$  are piecewise continuous and satisfy certain conditions. In the ninth part, the existence of a solution is proved for the case when the functions  $f$  and  $g$  are continuous and satisfy certain conditions. In the tenth part, the existence of a solution is proved for the case when the functions  $f$  and  $g$  are piecewise continuous and satisfy certain conditions.

In the eleventh part, the existence of a solution is proved for the case when the functions  $f$  and  $g$  are continuous and satisfy certain conditions. In the twelfth part, the existence of a solution is proved for the case when the functions  $f$  and  $g$  are piecewise continuous and satisfy certain conditions. In the thirteenth part, the existence of a solution is proved for the case when the functions  $f$  and  $g$  are continuous and satisfy certain conditions. In the fourteenth part, the existence of a solution is proved for the case when the functions  $f$  and  $g$  are piecewise continuous and satisfy certain conditions. In the fifteenth part, the existence of a solution is proved for the case when the functions  $f$  and  $g$  are continuous and satisfy certain conditions.

In the sixteenth part, the existence of a solution is proved for the case when the functions  $f$  and  $g$  are piecewise continuous and satisfy certain conditions. In the seventeenth part, the existence of a solution is proved for the case when the functions  $f$  and  $g$  are continuous and satisfy certain conditions. In the eighteenth part, the existence of a solution is proved for the case when the functions  $f$  and  $g$  are piecewise continuous and satisfy certain conditions. In the nineteenth part, the existence of a solution is proved for the case when the functions  $f$  and  $g$  are continuous and satisfy certain conditions. In the twentieth part, the existence of a solution is proved for the case when the functions  $f$  and  $g$  are piecewise continuous and satisfy certain conditions.

written text.

The second study reported in this article used twenty-four boys and girls from a modern school as subjects. These students ranged in age from fifteen to sixteen years. The tests used in this study were the same as those used in the previous investigation. However, in this case, one of presentations contained pictorial illustrations, but the other had no illustrations of any kind. The results indicated that there was no significant difference in the ability of the students to read and comprehend either kind of presentation.

Another investigation carried out by Vernon (1954) yielded results similar to the previous ones. Using twenty-four grammar school girls as subjects, ranging in age from eleven years three months to twelve years six months, Vernon attempted to assess the value of pictorial material in helping students to understand a printed text. The results indicated that there was no statistically significant evidence that the pictures helped the students to understand the material.

As a group, Vernon's studies indicate that graphic illustrations of various types may contribute to a reader's understanding of a printed text. However, as Vernon (1950) suggests, the lack of significant differences may be due to the inability of the subjects to effectively utilize the assistance offered by the graphic materials. If the student is either unable to read the graphic presentation and/or to integrate information obtained from it with that from a printed text, the value of the graphic material would be lost.

Vernon's studies have a number of limitations insofar as this investigation is concerned. These include the small size of the samples used; the omission of information as to how test groups were formed;





the fact that most of the subjects were older than the age group under study here; and the use of graphic presentations other than maps. However, the inclusion of these studies seemed warranted in that they are concerned with the ability of students to read graphic materials and integrate information from such presentations with that obtained from a printed text.

#### IV. SUMMARY

This chapter has presented the opinions of prominent educators and the research evidence concerning the ability of students to read maps, and to integrate information obtained from graphic materials with that from a printed text.

The evidence reviewed in the first major section of the chapter gave the general impression that sixth grade students are capable of understanding and utilizing the basic map reading skills. It was also indicated that such skills are not always well developed, but that they can be improved through systematic instruction. Since grade six students are capable of utilizing basic map reading skills, these should not be insurmountable obstacles in teaching such students to read maps within a **social studies** reference book.

However, in order to gain full value from graphic presentations in reference books, skills in addition to those required for map reading are probably necessary. The ability to integrate information gained from graphic presentations and printed texts seems to be what is required. The material reviewed in the second major section of this chapter indicated that such skills are not generally well developed in students. One study suggested that the teaching of such skills results in significant improvement.





## CHAPTER IV

### THE EXPERIMENTAL DESIGN

#### I. INTRODUCTION

This chapter describes the design of the study, the student sample, and the testing instruments which were used to provide measures of the variables. The section on the testing instrument includes an account of the construction of the Map-Text Comparative Reading Test, the main testing instrument used in the study. The refinement of this instrument in the pilot study is described. The procedure used in collecting the data is followed by a brief account of the statistical procedures utilized in the treatment of the data.

#### II. DESIGN OF THE STUDY

The plan employed in this study is a treatment by subjects design. The treatment consisted of an appraisal of the students' ability to gain factual information from various types of written and/or map presentations. As no testing instrument was available for this purpose, such an instrument was constructed and designated the Map-Text Comparative Reading Test. This test consisted of four separate tests, each of which presented the same factual information, in four different ways. One presentation consisted of words only; two used different combinations of words and map; while the fourth used a map only.

The total student sample of 200 grade six students was divided randomly into four equal groups. Each group of fifty students was given a different type of presentation of information concerning four

# THEORY OF THE

## CHAPTER I

The first part of the theory is devoted to the study of the properties of the functions which are defined by the integral

$$f(x) = \int_0^x \phi(t) dt$$

where  $\phi(t)$  is a function which is continuous in the interval  $[0, x]$  and which satisfies the condition

$$\phi(t) = \phi(1-t)$$

for all values of  $t$  in the interval  $[0, 1]$ . It is shown that the function  $f(x)$  is continuous in the interval  $[0, 1]$  and that it satisfies the condition

$$f(x) = f(1-x)$$

for all values of  $x$  in the interval  $[0, 1]$ . It is also shown that the function  $f(x)$  is differentiable in the interval  $(0, 1)$  and that its derivative is given by the formula

$$f'(x) = \phi(x) - \phi(1-x)$$

for all values of  $x$  in the interval  $(0, 1)$ . The second part of the theory is devoted to the study of the properties of the functions which are defined by the integral

$$g(x) = \int_0^x \psi(t) dt$$

where  $\psi(t)$  is a function which is continuous in the interval  $[0, x]$  and which satisfies the condition

$$\psi(t) = -\psi(1-t)$$

for all values of  $t$  in the interval  $[0, 1]$ . It is shown that the function  $g(x)$  is continuous in the interval  $[0, 1]$  and that it satisfies the condition

$$g(x) = -g(1-x)$$

for all values of  $x$  in the interval  $[0, 1]$ . It is also shown that the function  $g(x)$  is differentiable in the interval  $(0, 1)$  and that its derivative is given by the formula

$$g'(x) = \psi(x) + \psi(1-x)$$

for all values of  $x$  in the interval  $(0, 1)$ .

## CHAPTER II

The first part of the theory is devoted to the study of the properties of the functions which are defined by the integral

$$h(x) = \int_0^x \phi(t) \psi(1-t) dt$$

where  $\phi(t)$  and  $\psi(t)$  are functions which are continuous in the interval  $[0, x]$  and which satisfy the conditions

$$\phi(t) = \phi(1-t)$$

$$\psi(t) = -\psi(1-t)$$

for all values of  $t$  in the interval  $[0, 1]$ . It is shown that the function  $h(x)$  is continuous in the interval  $[0, 1]$  and that it satisfies the condition

$$h(x) = h(1-x)$$

for all values of  $x$  in the interval  $[0, 1]$ . It is also shown that the function  $h(x)$  is differentiable in the interval  $(0, 1)$  and that its derivative is given by the formula

$$h'(x) = \phi(x)\psi(1-x) - \phi(1-x)\psi(x)$$

for all values of  $x$  in the interval  $(0, 1)$ . The second part of the theory is devoted to the study of the properties of the functions which are defined by the integral

$$k(x) = \int_0^x \phi(t) \psi(t) dt$$

where  $\phi(t)$  and  $\psi(t)$  are functions which are continuous in the interval  $[0, x]$  and which satisfy the conditions

$$\phi(t) = \phi(1-t)$$

$$\psi(t) = \psi(1-t)$$

for all values of  $t$  in the interval  $[0, 1]$ . It is shown that the function  $k(x)$  is continuous in the interval  $[0, 1]$  and that it satisfies the condition

$$k(x) = k(1-x)$$

for all values of  $x$  in the interval  $[0, 1]$ . It is also shown that the function  $k(x)$  is differentiable in the interval  $(0, 1)$  and that its derivative is given by the formula

$$k'(x) = \phi(x)\psi(x) + \phi(1-x)\psi(1-x)$$

for all values of  $x$  in the interval  $(0, 1)$ .

topics, but was required to answer the same twenty questions. In this manner, it was possible to make comparisons between group achievement to determine which of the four types of presentations the students could utilize most effectively in gaining in factual information. The design of the study is diagrammed in Figure 2.

Since the results of this test depended on the control of variables which might affect the results, control was achieved through randomization. The pupil was the unit of randomization. According to Campbell and Stanley (1967, p. 25) " . . . the most adequate all purpose assurance of a lack of initial biases between groups is randomization."

The study also attempted to assess the effect of three variables on student achievement on the various presentations of the Map-Text Comparative Reading Test. Therefore, tests were given to measure mental ability and general reading ability, and the sex of the students was recorded. The tests used were the Co-operative School and College Ability Tests which will be referred to as SCAT in the remainder of this study, and the Word Meaning and Paragraph Meaning Tests of the Stanford Achievement Tests, which will hereafter be termed WM, PM, of SAT. Statistical procedures were utilized to determine the extent to which these two variables, as well as a third variable, sex, interacted with the various instruments.

### III. THE STUDENT SAMPLE

#### Selection of the Test Sample

The test population consisted of the 207 students enrolled in the sixth grade in a small city in northern Alberta. The test sample used contained 200 of these students. By having the seven extra students as





Topics	Type of Presentation Given to:			
	Group 1 (N=50)	Group 2 (N=50)	Group 3 (N=50)	Group 4 (N=50)
Vegetation Regions of Canada	Word Text Presentation	Word plus Map Presentation	Integrated Word and Map Presentation	Map Presentation
Surface Features of British Columbia	Word Text Presentation	Word plus Map Presentation	Integrated Word and Map Presentation	Map Presentation
River Systems of the Prairie Provinces	Word Text Presentation	Word plus Map Presentation	Integrated Word and Map Presentation	Map Presentation
Mining in New Brunswick and Nova Scotia	Word Text Presentation	Word plus Map Presentation	Integrated Word and Map Presentation	Map Presentation

FIGURE 2

THE DESIGN OF THE STUDY



potential subjects, allowance for absentees at the time of testing was possible. A total of 203 students actually wrote the tests. To reduce the test sample to the required number of 200, the papers of three students were randomly withdrawn from the completed Map-Text Comparative Reading Test, and from the other tests administered in the study.

The study was conducted at the sixth grade level, because this is designated as the last grade of elementary school in Alberta. At this level, students are beginning to use reading quite extensively as a tool in the various subject areas. In social studies in particular, they are required to read various reference materials as sources of information for reports and projects. In addition, the map reading program outlined in the Elementary Curriculum Guide for Social Studies-Enterprise and published by the Alberta Department of Education has been available for four years in elementary schools. Thus, students are expected to have facility in using the basic map reading skills such as reading the legend, understanding the map symbols used, using the scale, determining relative and absolute direction, and locating places by means of a grid system. In addition, a degree of skill in map interpretation is also expected.

#### Characteristics of the School District

The school district in which the study was carried out operates four elementary schools, staffed by fifty-nine teachers. The elementary school teachers range in years of teacher education from one to six, with an average of two and nine-tenths. In terms of experience, the elementary school teachers had from less than one to twenty-eight years with an average of eight and four-tenths years. The reading program employs primarily a well known series of basal readers with other basal reader





series, and supplementary materials, such as phonic workbooks, available for special groups of students. The social studies program is based on the Elementary Curriculum Guide for Social Studies-Enterprise provided by the Department of Education, as well as resource units which have been developed in the school district.

### Grouping for the Study

For the purpose of the investigation it was necessary to divide the test sample into four groups. To ensure the equality of the groups in terms of variables such as reading ability, mental ability, and sex which might affect performance on the Map-Text Comparative Reading Test, group membership was determined by means of a random procedure, using the student as the unit of randomization. Each grade six student in the school district was allotted a number, and then the students were assigned to groups from one to four in succession using a table of random numbers (Arkin & Cotton, 1950, pp. 142-145). In this manner, four groups with fifty students each were provided.

### Characteristics of the Students in the Test Sample

The sample included 107 boys and 93 girls, ranging in age at the time of testing from ten years six months to thirteen years three months. As Table I shows the majority of the students were eleven or twelve years of age.

The results of the SCAT Form 4A, which was used to provide a measure of mental ability, were interpreted by using a percentile table developed by the Edmonton Public School Board. The SCAT Manual for Interpreting Scores (Educational Testing Service, 1957) encourages the development of such norms because it is possible to:





. . . compare students' scores with the scores of students with whom they are actually competing in school, students from the same geographic area, students who have had similar education opportunities (p. 7).

The distribution of scores which is given in Table II, indicates a wide range in mental ability with scores ranging from the first to the 99+ percentile. Of the 200 students tested, 93 were below the fiftieth percentile and 107 above it. However, the normal or bell shaped distribution of scores is not evident. More students have scored at the extremes than might be expected.

TABLE I

## CHRONOLOGICAL AGES OF STUDENTS IN THE TEST SAMPLE

Age in Months From:	120	132	144	156
	to	to	to	to
	131	143	155	167
Number of Students: (N=200)	4	91	89	16

TABLE II

MENTAL ABILITY RATINGS OF THE STUDENTS IN TEST SAMPLE ON SCAT FORM 4A  
BASED ON EDMONTON PUBLIC SCHOOL BOARD NORMS (1958)

Percentile Ratings From:	0	11	21	31	41	51	61	71	81	91
	to	to	to	to	to	to	to	to	to	to
	10	20	30	40	50	60	70	80	90	99+
Number of Students: (N=200)	14	20	18	22	19	24	21	23	23	16

As a measure of reading ability, the combined scores of the WM



and PM Tests of SAT were used. To describe the sample of students in the study, the results of these two tests have been presented separately in Table III in the form of a distribution based on the norms provided by SAT.

There was a wide range of scores in the results on both the WM and PM Tests, ranging from the first to 99+ percentile. The subjects under study, were superior to the population used to prepare the percentile ranks. On the WM Test 112 students were above the fiftieth percentile and 88 below it. Of the 200 students tested with the PM Test, 110 scored above the fiftieth percentile, and 90 below it.

Information concerning the characteristics of the students in each presentation group is provided in Appendix A.

#### IV. THE TESTING INSTRUMENTS

Since the results of the investigation depended upon the adequacy of the testing instruments, an examination of the three tests used in the study was warranted.

##### The Stanford Achievement Test Form W

The first two tests of this battery were used to provide a measure of general reading achievement. Test One, the WM Test, consists of forty-eight items, each of which provides a stimulus sentence with a single word missing. From a choice of four possible answers, the subject is required to select one. Test Two, the PM Test, consists of sixty-four items. The subject is required to read each of the paragraphs, and to select the most appropriate of four words or phrases provided, to complete portions of the paragraphs which have been left out.

The reliability of the two tests used, as calculated by the odd-





TABLE III  
DISTRIBUTION OF SCORES IN PERCENTILE RANKS ON THE WM AND PM TESTS  
OF THE STANFORD ACHIEVEMENT TESTS BASED ON SAT NORMS

<u>WORD MEANING TEST</u>												
Percentile Ranks From:	0	10	20	30	40	50	60	70	80	90		
to		to	to	to	to	to	to	to	to	to		
9	19	29	39	49	59	69	79	89	99+			
Number of Students (N=200)	2	16	30	22	18	30	20	27	27	8		
<u>PARAGRAPH MEANING TEST</u>												
Percentile Ranks From:	0	10	20	30	40	50	60	70	80	90		
to		to	to	to	to	to	to	to	to	to		
9	19	29	39	49	59	69	79	89	99+			
Number of Students (N=200)	1	9	17	30	33	20	28	14	27	21		



even split half method is .90 for the WM Test and .93 for the PM Test. In addition, the Kuder-Richardson formula 20 provides reliability coefficients of .90 and .92 for the WM Test and PM Test respectively (Kelley, Madden, Gardner, & Rudman, 1964). These coefficients are well within accepted limits which range from .70 to .98 (Guilford, 1965, p. 104).

The authors suggest that content validation demands a systematic comparison of the test's contents with the curriculum used by the school that plans to use the test (Kelley et al., 1964, p. 23). To facilitate such a comparison, a content outline is provided.

The validity of the 1964 version of SAT has been determined by correlating results with the 1953 edition of the same test. The authors claim that such a comparison is legitimate in that the earlier test had been accepted as an " . . . excellent measure of achievement (Kelley et al., 1964, p. 23)." The correlations between the two tests were .80 for WM and .74 for PM.

#### Cooperative School and College Ability Tests Level 4 Form 4A

SCAT aids in estimating the capacity of a student to undertake the academic work in the next higher level of schooling. They measure the two kinds of school related abilities which are most important in the greatest number of school and college endeavors: Verbal and Quantitative. SCAT provides separate scores for each of these abilities as well as a total score when the two are combined.

The technical report concerning the SCAT indicates that the reliability of Level 4 Form 4A as measured by the Kuder-Richardson formula 20 is .94 for the Verbal Tests and .91 for the Quantitative



Tests. The reliability for the total test is .96.

A measure of validity has been established for Level 4 Form 4A of the SCAT by correlating its results with the grade achieved by students in a number of schools. In a study involving six schools, the overall average student achievement in English, mathematics, social studies, and science at the seventh grade level correlated .88 with the total SCAT score (Kelley et al., 1964, p. 10).

In summing up his views on the SCAT series, Fowler (1959, p. 455) stated:

Undoubtedly, SCAT is a superior test series. It clearly shows the result of careful planning, an excellent experimental program, and the use of sound, up-to-date statistical procedures.

The scores obtained from this test have been used as a measure of mental ability. Although it appears to be an achievement test, according to reviewers such as Fowler (1959) and Stanley (1959), it is a legitimate measure of mental ability. Fowler (1959, p. 455) made this point when he stated " . . . SCAT measures ability only - it is not a measure of achievement in the ordinary sense of the term."

#### The Map-Text Comparative Reading Test

Purpose of the Test. As no testing instrument was available for the type of information being sought in this study, a test was constructed and designated the Map-Text Comparative Reading Test. Its purpose was to provide measures of the ability of students to read and gain factual information from presentations consisting of a written text only; a combined written text and map, each of which presents full information; an integrated written text and map which in conjunction with each other present full information, but separately only provide partial information;





and a map only. In this way the ability of students to effectively obtain information from the different types of presentations could be assessed. It is acknowledged, however, that the presentations containing maps make a greater cognitive demand on the reader.

Organization of the Test. The Map-Text Comparative Reading Test is actually four subtests which present the same information in four different ways. Each student group was assigned to only one subtest. The questions which were answered by the students were identical, regardless of the subtest to which they were assigned.

Each of the four subtests is further divided into four sections, each section presenting reading material on a separate topic. Immediately following the information on a given topic, a series of five questions based on this information is provided. Therefore, for all four topics there are twenty questions to be answered. The format of the test is diagrammed in Figure 3. In order to assess the achievement of students on the four different types of presentations, each randomly selected group was assigned one of the four types of presentations and the results determined by comparing the mean achievement scores of the groups.

Procedure Used to Equate the Reading Difficulty of the Various Presentations of Information. In order to ensure that the various presentations which contained a written text were of equal reading difficulty, vocabulary counts of the number of words in each presentation which did not appear on the Dale list of 3000 familiar words (Dale & Chall, 1948) were recorded. These were compared to the total number of words in the presentations, and expressed as a per cent, in an attempt to establish a proportion that was equivalent. As can be seen in Table IV,



Word Text Presentation	Word plus Map Presentation	Integrated Word and Map Presentation	Map Presentation
General Directions for the <u>Map-Text Comparative Reading Test</u>			
Topic Number 1			
Vegetation Regions of Canada			
Five Questions on the Vegetation Regions of Canada			
Topic Number 2			
Surface Features of British Columbia			
Five Questions on the Surface Features of British Columbia			
Topic Number 3			
The River Systems of the Prairie Provinces			
Five Questions on The River Systems of the Prairie Provinces			
Topic Number 4			
Mining in New Brunswick and Nova Scotia			
Five Questions on Mining in New Brunswick and Nova Scotia			

FIGURE 3

THE GENERAL FORMAT OF THE MAP-TEXT COMPARATIVE READING TEST





TABLE IV  
NUMBER OF WORDS NOT ON THE DALE LIST OF 3000 FAMILIAR WORDS AS COMPARED TO  
THE TOTAL NUMBER OF WORDS IN THE PRESENTATION

Reading Selection Based on the Topic	Word Text Presentation	Text plus Map Presentation	Integrated Word and Map Presentation	Map Presentation*
Vegetation Regions of Canada	41/346 (12%)	41/346 (12%)	36/325 (11%)	-
Surface Features of British Columbia	34/442 ( 8%)	34/442 ( 8%)	26/360 ( 7%)	-
River Systems of the Prairie Systems	34/313 (11%)	34/313 (11%)	26/295 ( 9%)	-
Mining in New Brunswick and Nova Scotia	38/295 (13%)	38/295 (13%)	30/233 (13%)	-

\*No attempt was made to determine a vocabulary count for the Map Presentation.



page 80, the greatest difference in the number of words not on the Dale list compared to the total number of words in the presentation was 2 per cent for the "River Systems of the Prairie Provinces." The other three topics were equal or within 1 per cent for the different presentations. On this basis the assumption was made that for all practical purposes the vocabulary level for the various presentations of each topic was equivalent.

Test Content. The content chosen for the test dealt with the various physical and cultural features of Canada. This content was selected in order to equalize student background information. All students in Alberta study a major unit of work concerning Canada at the fifth grade level (Department of Education, 1965, p. 24); therefore, a common background knowledge of Canada's geography can be assumed. The use of this type of content seemed to be more realistic than using hypothetical texts and maps in that a person is hardly ever completely devoid of a degree of background knowledge of his topic when reading a book. Such knowledge may assist the students in this study in understanding the test questions, but the questions are specific and cannot be answered from general knowledge.

The geography book, A Geography of Canada (Sager, Darroch & Jardine, 1960), provided the basic content for the construction of the testing materials. This book was selected because it contains examples of information presented in word and map combinations. It also contains maps of the type used most frequently in the authorized social studies reference books for Alberta schools. At the same time, it is a relatively obscure book, in that it is not listed as either a primary or





secondary reference in the publication Enterprise Activities for Elementary Schools (Department of Education, 1967).

Characteristics of the Test Items. A test of sufficient length to provide a definite distribution of achievement scores was desired. However, it was equally advantageous to produce a test short enough to avoid student fatigue. As a result, twenty questions were used in the final draft of the test, five on each of four topics.

The items were designed to test the ability of students to read for factual information. Depending on the type of presentation, students had to possess the reading skills necessary for obtaining information from a written text, a map, or one of the two types of map and text combinations. The specialized map skills required included the reading of a number of symbols (some of which were explained by the map legend, others were not); reading directions; using the scale of miles to estimate or calculate distance; recognition of lines of latitude and longitude; and recognition of the names of rivers, provinces, cities and other natural and cultural features.

According to the Elementary Curriculum Guide for Social Studies-Enterprise (Department of Education, 1967), the map reading skills tested by the items are the minimum of what can be expected of children who have finished the elementary school program. In fact, the grade six program stresses the application of map reading skills to topic situations on the assumption that such basic map reading skills as use of the scale, finding direction, reading latitude and longitude, and reading common map symbols have been developed in previous grades. Unless these skills have been mastered, higher level interpretive skills cannot be learned by students.





The Map-Text Comparative Reading Test employed multiple choice, objective type questions. An objective type test was produced to facilitate scoring and statistical analysis (Thorndike & Hagen, 1955, p. 41). Multiple choice items were utilized because they are generally considered to be the most effective of the objective item types (Thorndike & Hagen, 1955, p. 58), (Travers, 1955, p. 179).

In general, an attempt was made to follow established procedures in test construction as outlined by Thorndike and Hagen (1955) and Travers (1955). The stem or question in each item was stated in as clear and concise a manner as possible. Item responses were briefly stated and of equal length. Care was taken to avoid providing cues by using a word in the correct response which also appeared in the stem; using words in the possible answers which sounded like those used in the stem; or providing grammatical cues. Every item is discrete in that the ability to answer it correctly does not depend on knowledge acquired from previous or subsequent items. The test includes two items which are stated negatively. However, in accord with sound test construction theory the word "not" was underlined to ensure that the students would be aware of the negative nature of the question. Every distractor or alternate answer used is a plausible alternative to the correct answer in the sense that some students selected it. Questions were chosen for the final draft of the test in which the distractors were selected more often by student scoring at a lower level on the test as a whole. Questions in which the higher achieving students saw a logical possibility which led them to the wrong answer were avoided. A detailed discussion of the criteria used in selecting items for the final draft of the test is presented in the section of this chapter dealing with the pilot study.



A very important factor in test item construction is the need to avoid vocabulary difficulties which might interfere with the pupils' performance (Thorndike & Hagen, 1955, p. 51). If the student does not understand the question, he cannot be expected to provide a correct answer. For this reason, the Thorndike and Lorge (1959) word list was used as a guide in selecting the vocabulary used in the questions. The various words were checked at the grade five and six level, which could be referred to as a grade 5.5 level. Only eight of the 384 words used in the twenty questions were not acceptable at this level. This vocabulary control for the questions was considered satisfactory because students in the study had nearly completed grade six when they were tested.

#### V. THE PILOT STUDY

A pilot study was conducted in a small town, twenty miles from a large urban center, on May 6, 1968. The subjects in this study were sixty grade six students arranged in two classes of equal size. The pilot study was conducted by the investigator with the assistance of the classroom teachers.

##### Purpose of the Pilot Study

The study was undertaken for two principal reasons. The first was to provide data from which a measure of test reliability could be determined. Using this data, it was also possible to do a test item analysis in terms of item difficulty, item validity, and item reliability.

The second major purpose of the pilot study was to determine the effectiveness of the testing procedures. In this regard, an attempt was made to observe student reaction to the general directions for the test





and to the type of score sheet used, the time taken by the various groups to complete the test, the format of the test, and the clarity of the questions. These reactions were observed both while testing was in progress, and after all tests had been completed. An informal discussion of these matters was carried on with the classes after the completion of the test.

### Test Reliability

Since the first and final drafts of the Map-Text Comparative Reading Test differed in the number of items they included, the measure of reliability gained from the use of the final draft in the pilot study could only be considered a rough indication of what to expect of the final draft.

To establish a measure of reliability for the test, the Kuder-Richardson formula 20 was used. This formula is a measure of the homogeneity or internal consistency of the items on the test (Ferguson, 1966, p. 379). The numerical value of the reliability coefficients provided by the Kuder-Richardson formula 20 is directly dependent on the intercorrelations between items on the test. The greater the degree to which the items measure the same attribute, the higher the reliability coefficient (Magnusson, 1967, p. 118).

The reliability coefficient for the first draft of the test was 0.71. Although this is not particularly high, it is within acceptable limits. Guilford (1965, p. 104) states that " . . . in practice we expect reliability coefficients to be in the upper brackets of r value, usually .70 to .98 . . . ."



### Validity of the Test

Content validity can be claimed for the test on the grounds that the individual items represent the kinds of factual questions which appear in the grade six social studies books authorized by the Alberta Department of Education.

Construct validity can be claimed for each of the individual items, as indicated in the following section on Item Analysis. For the items as a whole, the validity indices are high.

### The Item Analysis

Although the final draft of the Map-Text Comparative Reading Test was to include twenty test items, twenty-eight items were used in the pilot study. This made possible the exclusion of the eight less effective items. Since the content of the test breaks down into four distinct sections, seven questions had been composed for each section. Using the item validity and difficulty as criteria, the two poorest questions in each section were then excluded from the final draft of the test.

Item Difficulty. The item analysis program developed by the Educational Research Services at the University of Alberta was used and provided a measure of difficulty for each item on the test. The proportion ( $p$ ) of the group selecting the correct answer for an item is an index of item difficulty (Garrett, 1958, p. 363). This index can theoretically range from 1.00, a situation in which all members of the group taking the test pass the item, to 0.00, a situation in which no member of the group passes the item. An item with a difficulty index of .50 ( $p = .50$ ) differentiates more between members of a group or brings out more individual differences than either a harder or easier item (Garrett, 1958,





p. 363). The greatest degree to which an item can make such differentiations is called maximum variance. In general, as the difficulty index rises or falls from .50, the item variance decreases.

An attempt was made to retain items which provided a maximum dispersion of scores. Thus items which had an index of difficulty near .500 were retained. According to Garrett (1958, p. 363), "Other things being equal, items of moderate difficulty (40-50-60% passing) are preferred to those which are easier or much harder." Table V indicates the number of items retained which were within various categories of difficulty. The easiest item retained had a difficulty index of .783, and the most difficult an index of .417. Items with difficulty indices more extreme than these were excluded because they were unsatisfactory in terms of the other criteria used in item selection.

TABLE V  
DISTRIBUTION OF TEST ITEMS ACCORDING TO  
THE INDEX OF DIFFICULTY

	Range of Difficulty Indices					
	0.000	0.400	0.500	0.600	0.700	0.800
	to	to	to	to	to	to
	0.399	0.499	0.599	0.699	0.799	0.999
Number of Items (N=20)	nil	5	6	4	5	nil

Item Validity. According to Guilford (1965, p. 497) a more important factor than item difficulty is whether or not a given item discriminates between individuals in line with other items in the test. In other words, the validity index of an item is more important than the difficulty index.





The item analysis program used provides a biserial coefficient of correlation for each item. This coefficient indicates the extent to which the attributes measured by the criterion (total test score) are also measured by the item (Guilford, 1965, p. 398). In this manner, the validity index of an item is determined. Since the criterion used in this program was the total test score, the type of validity involved is construct validity (Guilford, 1965, p. 498), (Kerlinger, 1964, p. 453).

Garrett (1958, p. 368) states that test items with validity indices of .200 or higher are generally regarded as satisfactory. The items selected for use in the final draft of the Map-Text Comparative Reading Test had validity indices ranging from .325 to .925. Table VI presents a breakdown of the distribution of the number of test items according to their validity indices.

TABLE VI  
DISTRIBUTION OF TEST ITEMS ACCORDING TO VALIDITY INDICES FOR THE  
FIRST DRAFT OF THE MAP-TEXT COMPARATIVE READING TEST

	Biserial Coefficients of Correlation From:							
	0.000	0.300	0.400	0.500	0.600	0.700	0.800	0.900
	to	to	to	to	to	to	to	to
	0.299	0.399	0.499	0.599	0.699	0.799	0.899	0.999
Number of Items (N=20)	nil	4	3	8	3	1	nil	1

Although there are variations among items, it seems reasonable to conclude that the twenty items selected for the final draft of the test are all good measures of the attributes measured by the test as a whole.



## V. DATA COLLECTION

The Map-Text Comparative Reading Test and the SCAT were administered during the week beginning on May 13, 1968. The investigator and a trained assistant administered the tests and supervised the classes while the testing was in progress. Standardized directions and testing procedures were used in every instance. For ease of administration the Map-Text Comparative Reading Test was written first. After a brief break, the SCAT was given. Since the SCAT manual recommends that a break be given between sections when testing is done in one sitting, a fifteen minute recess was allowed.

Both tests used score sheets of the type in which the student fills in a small space to designate his choice of responses from among the four possible alternatives. As a result of past experience with this type of score sheet, students were obviously familiar with its use.

The WM and PM Tests of SAT were given in the grade six classes during the week beginning June 3, 1968, as these tests were not available at the time SCAT and the Map-Text Comparative Reading Test were administered. The tests were given by the classroom teachers under the direction of the school principals and the assistant superintendent. All students wrote the tests at the same time.

## VI. TREATMENT OF THE DATA

The score sheets for the Map-Text Comparative Reading Test were marked by the IBM Optical Mark Reader. The SCAT was hand scored by the investigator and a trained assistant. The SAT were scored by the classroom teachers and verified by the investigator.





The results from all the tests were punched onto IBM data cards and the data were analyzed by means of statistical programs produced by the Division of Educational Research, Faculty of Education, University of Alberta.

### Item Analysis

The Testan program was utilized to provide item analyses for both the first and second drafts of the Map-Text Comparative Reading Test. This provided information needed to reduce the first draft of the test from twenty-eight to twenty items. The item analysis of the second draft provided a second check on the effectiveness of the test.

### One-Way Analysis of Variance

In order to ascertain whether or not there were significant differences in student performance according to the type of presentation of information they received, a one-way analysis of variance was completed. Since it is assumed when using this analysis that the individual random groups have equal variances, a Chi Square test to determine the homogeneity of variance was carried out. In addition, Scheffé's method for the multiple comparison of means was used to determine which of the pairs of means (if any) were significantly different in magnitude (Ferguson, 1966, pp. 295-296).

### Multiple Regression Analysis

This type of statistical analysis was used to test all of the hypotheses which were concerned with either the interaction or main effects of the variables sex, general reading ability, and mental ability.

This particular statistical technique was selected because of



sensitivity in detecting interaction effects between variables, such as mental ability, and the treatment such as the various presentations of the Map-Text Comparative Reading Test (Foster, 1968, p. 6). A second major reason for utilizing this procedure was the flexibility it offered in representing continuous variables. With this statistical technique it is not necessary to convert continuous measures, such as general reading ability to categorical measures (Foster, 1968, p. 10).

Multiple regression analysis is based upon the assumption that performance on a given criteria, which is in this study is achievement on the Map-Text Comparative Reading Test, can be expressed in terms of some additive combination of variables (Hunka, 1966, p. 2).

However, any given variable might contribute to criterion prediction in interaction with another variable rather than by doing so directly itself. In fact, it is meaningless to assess the main effects of a variable which interacts significantly with another variable, because this involves making assumptions which are not legitimate (Hunka, 1966, p. 5). Therefore, a set of product variables representing interaction between each of the variables sex, mental ability, and general reading ability, and the types of presentations have been used in this study to test for significant interaction. Any variable found to interact significantly with the types of presentations was not included in further tests of main effects.

## VII. SUMMARY

This study employed a treatment by subjects design. The treatment consisted of an appraisal of the ability of four randomly selected groups of fifty grade six students to read four different types of presentations





of factual information. Group 1 was given a Word Text Presentation, Group 2 was given a Word plus Map Presentation, Group 3 an Integrated Word and Map Presentation, and Group 4 a Map Presentation. All students were required to answer the same set of factual questions.

The test sample consisted of 200 students from a small urban centre in Northern Alberta. In the total sample there were 93 girls and 107 boys, ranging in chronological age from ten years six months to thirteen years three months. The results of SCAT Form 4A indicated a wide range in the mental ability of the students, with scores from the first to the 99+ percentile on Edmonton Public School Board Norms. A wide range in reading ability was evident, with scores on WM and PM Tests of SAT from the first to 99+ percentile according to SAT norms.

A technical examination of SCAT Form 4A and the WM and PM Tests of SAT revealed that they were reliable and valid. The testing instrument which provided the four different presentations of factual information as previously mentioned was designated the Map-Text Comparative Reading Test. It was produced in accord with accepted principles of test construction. The items were of the objective type with multiple choice answers. Reliability according to the Kuder-Richardson formula 20, was .71 for the first draft. Content validity was claimed, and item validity indices were all above .200, an acceptable level. Items of moderate difficulty were retained for the final draft of the test, as they provided for maximum discrimination among scores.

The data were collected in May and June of 1968 and subjected to item analysis, one-way analysis of variance, and multiple regression analysis.





## CHAPTER V

### THE FINDINGS OF THE STUDY

#### I. INTRODUCTION

This chapter will present three sections on the findings of the study, and one on the observations. The first section has been devoted to presenting results of a test analysis of the final draft of the Map-Text Comparative Reading Test which was used in the main study. This includes findings about test reliability, difficulty, and validity. The second section presents the findings from a one-way analysis of variance concerning student achievement on the various presentations of the Map-Text Comparative Reading Test. The results of a multiple regression analysis concerning the significance of the relationships between the variables of mental ability, general reading ability, and sex, and achievement on each of the four presentations of the Map-Text Comparative Reading Test are in the third section. The last section of this chapter presents observations made while testing with the Map-Text Comparative Reading Test.

#### II. FINDINGS OF THE TEST ANALYSIS

The test analysis program developed by the Department of Research Services, Faculty of Education, University of Alberta was used to analyze student responses on the final draft of the Map-Text Comparative Reading Test to confirm the results of the pilot study concerning the reliability, difficulty, and validity of the test.



### The Reliability of the Final Draft of the Map-Text Comparative Reading Test

A measure of the internal reliability of the Map-Text Comparative Reading Test was calculated by means of the Kuder-Richardson formula 20. The final draft which was used in this investigation had a Kuder-Richardson formula 20 reliability coefficient of 0.70. Although this is not high, it is within acceptable limits for a reading achievement test (Guilford, 1965, p. 104).

### The Difficulty of the Final Draft of the Map-Text Comparative Reading Test

The majority of the items used in the final draft of the Map-Text Comparative Reading Test were of medium difficulty. Fifteen of the twenty items had difficulty indices ranging from .400 to .699. Because of the brevity of the test, there was a need for questions which would provide maximum discrimination. Therefore, test items with difficulty indices near .500 were retained in the final draft of the Map-Text Comparative Reading Test. Table VII provides a breakdown of test items in terms of level of difficulty.

TABLE VII

DISTRIBUTION OF TEST ITEMS OF THE FINAL DRAFT  
OF THE MAP-TEXT COMPARATIVE READING TEST  
ACCORDING TO INDICES OF DIFFICULTY

	Difficulty Indices From:					
	0.000 to 0.399	0.400 to 0.499	0.500 to 0.599	0.600 to 0.699	0.700 to 0.799	0.800 to 0.999
Number of Items (N=20)	1	2	6	7	4	nil

Difficulty indices ranged from 0.350 for the most difficult item to 0.725 for the easiest. There are more easy than difficult items





(difficulty indices of more than .500). This can be justified, in that the poorer student is provided with a greater opportunity to gain a feeling of success while writing the test, and therefore, is more inclined to put a reasonable effort into answering the remaining test questions.

#### The Validity of the Final Draft of the Map-Text Comparative Reading Test

If the assumption is made that the total test has content validity, the individual item is valid to the extent that it measures the same thing as the total test score (Kerlinger, 1964, p. 453). Garrett (1953, p. 368) states that an item which correlated above 0.200 with the total test score is satisfactory; therefore, all items on the Map-Text Comparative Reading Test would qualify as valid items. In fact, only one item, with a validity index of 0.291, falls slightly below a validity index of 0.300. Table VIII provides a summary of the item validity indices.

TABLE VIII

DISTRIBUTION OF TEST ITEMS OF THE FINAL DRAFT OF THE MAP-TEXT  
COMPARATIVE READING TEST ACCORDING TO VALIDITY INDICES  
(BISERIAL COEFFICIENTS OF CORRELATION)

	Validity Indices From:						
	0.000	0.300	0.400	0.500	0.600	0.700	0.800
	to	to	to	to	to	to	to
	0.299	0.399	0.499	0.599	0.699	0.799	0.999
Number of Items (N=20)	1	3	5	5	4	2	nil

### III. FINDINGS CONCERNING THE ACHIEVEMENT OF GRADE SIX STUDENTS ON THE DIFFERENT PRESENTATIONS OF THE MAP-TEXT COMPARATIVE READING TEST

Social studies reference books contain a variety of arrangements of verbal texts and maps for the purpose of presenting factual information.



The main question which this investigation attempted to answer was whether or not there are differences in the ability of grade six students to read factual information from four different types of presentations which typically appear in social studies books. These include a word text presentation, a word plus map presentation, an integrated word and map presentation, and a map presentation of information.

As can be seen in Table IX, there were differences in the group means, variances, and standard deviations. However, before an analysis of variance could be used to determine the significance of these differences, two conditions had to be met. The first was that groups must be formed by random selection. This requirement was met by assigning students to groups randomly. The second condition was that there must be homogeneity of variance among the groups. To determine whether or not the variances of each of the separate groups were significantly different, a Chi square test of the homogeneity of variance was completed. The results indicated that the differences in group variances were not significant, and the one-way analysis of variance was completed.

The results of the one-way analysis of variance, as shown in Table X, page 98, indicated that there were highly significant differences between the four presentation group means. The value of  $F$  was 15.70, which had an associated probability of 0.000003, significant beyond the 0.00001 level.

In order to determine exactly which pairs of means were significantly different, Scheffé's procedure for the multiple comparison was utilized.

This procedure compared the means of each group with the mean of every other group in order. The results, which appear in a probability





TABLE IX

THE MEAN, VARIANCE, AND STANDARD DEVIATION FOR EACH OF THE PRESENTATIONS OF THE  
MAP-TEXT COMPARATIVE READING TEST AND FOR THE COMBINED PRESENTATION GROUPS

Type of Presentation	Number of Students Receiving the Presentation	Mean Score	Variance	Standard Deviation
Group 1 Word Text Presentation	50	14.22	12.13	3.48
Group 2 Word plus Map Presentation	50	13.04	15.84	3.98
Group 3 Integrated Word and Map Presentation	50	9.94	9.08	3.01
Group 4 Map Presentation	50	10.80	12.61	3.55
Total Test All Presentations Combined	200	12.00	15.09	3.89





matrix in Table XI demonstrate where the significant differences are found.

TABLE X

THE RESULTS OF A ONE-WAY ANALYSIS OF VARIANCE TO DETERMINE THE SIGNIFICANT DIFFERENCES IN ACHIEVEMENT BETWEEN THE PRESENTATION GROUPS

Source	s.s.	df	m.s.	F	P
Between Groups	584.68	3	194.89	15.70	0.000003*
Within Groups	2433.32	196	12.41		

\*Significant at the 0.00001 level of confidence

The difference in mean score between Group 1, the group which received the word text presentation of information and Group 2, the group which was given complete information in both a word text presentation and a map presentation, was not significant. This seems to indicate that for the students in this investigation, the presence of a map which reinforced a written text by presenting redundant factual information, did not assist the student in gaining factual knowledge. This could be the result of a lack of skill in map reading, as well as an inability to relate factual information to a verbal text, and therefore, sole dependence on the written text as a medium of communication. The fact that the mean for text group was higher suggests that the presence of the map may tend to confuse the students rather than help them.

The difference between the means of Group 1 and Group 3 (the group which used the integrated map and text presentation) was highly significant ( $p < .001$ ). The integrated map and text presentation made it necessary for the students to read both the written text and the map



TABLE XI

PROBABILITY MATRIX FOR SCHEFFE'S MULTIPLE COMPARISON  
OF THE MEANS OF THE FOUR PRESENTATION GROUPS

	Group 1 Word Text Presentation	Group 2 Word plus Map Presentation	Group 3 Integrated Word and Map Presentation	Group 4 Map Presentation
Group 1 Word Text Presentation	-1.0000	0.4250	0.0000**	0.0001**
Group 2 Word plus Map Presentation		1.0000	0.0004**	0.0196*
Group 3 Integrated Word and Map Presentation			1.0000	0.6852
Group 4 Map Presentation				1.0000

\*significant at the .05 level of confidence

\*\*significant at the .01 level of confidence





to gather all of the factual information required to answer the test questions. Of the four types of presentations of information used in this investigation, the students scored lowest on the Integrated Map and Text Presentation and the highest on the Word Text Presentation, as indicated by their group mean scores of 14.22 and 9.94.

This situation seems to indicate that when the students were forced to read a map in conjunction with a written text in order to gain necessary information, they encountered difficulty. This is understandable as this presentation requires the use of a number of skills in addition to those used in reading a word text. Physical eye adjustments are necessary. The reader must move his eyes from the word text to the map, and back again. There must be an adjustment made in the actual directional movement of the eyes. The continual left to right movement and right to left return sweep of the eyes used in reading a word text, does not apply to a map. Therefore, when a word text and map are read in conjunction with one another, this may be a source of confusion.

Mental adjustments are also required. In reading only a few pages, the reader may be required to adjust from the English words to the symbols used on maps a dozen times. Skills in making these physical and mental adjustments is needed before the reader can fit the ideas from the map and word text into one organized stream of ideas.

The difference between the means for Group 1 and Group 4 was also highly significant ( $p < .01$ ). Of the four types of presentations of information used in this study, the Text Presentation given Group 1 and the Map Presentation given Group 4 were the most different in form. Groups 2 and 3 included both a map and text. The results clearly demonstrate that as a group, the students tested were significantly more



proficient at reading a test than a map for factual information. Perhaps this is to be expected. Students spend a much greater time in elementary school learning to read written words than they do in learning to read maps. However, for the grade six student, learning to read factual material as found in the content areas, such as social studies, is a relatively recent undertaking. Thus its comparison with map reading ability seems to be realistic. In addition, if the program for developing map reading as outlined by the Department of Education in the publication, Alberta Elementary Curriculum Guide for Social Studies-Enterprise, is adequate, it seems reasonable to assume that students should have developed considerable skill in using the basic map reading skills to secure factual information from maps.

These findings of the differences between Group 1 and Group 4 indicate that this program, or at least the program insofar as it was applied by the schools, did not adequately prepare students to read maps for basic factual information. For the students in this study, it would appear that such information could best be communicated by written words alone.

The difference in mean score between Group 2 and Group 3 was also highly significant ( $p < .01$ ). Group 2, which scored higher, was presented with complete information in both map and text, while Group 3 was presented with partial information in the text, and the remaining information in a map. Since Group 2 scored significantly higher than Group 3, it seems reasonable to assume that the students probably utilized only one of the mediums of presentation to gain the information, and did so quite successfully. However, when forced to read both text and map, the students scored significantly lower, which could indicate a lack of skill





in map reading, a lack of flexibility in going back and forth between the written text and map during the course of reading, or both.

A comparison of group means between Group 2, the group which had both the complete text and the complete map presentation, and Group 4 which had only the complete map presentation revealed a highly significant difference in favor of Group 2.

This finding appears to be a clear indication of the reliance of the students on a verbal text to secure factual information. Since the maps used in each presentation were identical, the difference in mean score is logically attributable to the presence of the written text in the presentation given to Group 2. It would appear that the students under study simply have greater facility with the skills required for reading factual information from a verbal text than with those required for reading factual information from a map.

However, to assume that the presence of a verbal text is an asset in all types of presentations is not justified. Group 3, which received partial text and partial map information, did not perform better than Group 4, which received information in the form of a map only. In fact, although not a significant difference, the mean score for Group 3 (9.940) was lower than that for Group 4 (10.800). It seems that any advantage provided by the presence of some of the necessary information in verbal text form is offset by an inability on the part of the students to read a map for factual information and/or to relate the information from map and text in a coherent manner. It is conceivable that when presented with both a map and text, the students may rely entirely on the text, and completely ignore the map. If this is the situation, the findings are understandable. In Group 3, the text presented only about half of the





information; therefore, the students in Group 4, who had complete information in a map would perform as well or better because they were forced to read the map.

The null hypothesis which states that there are no differences in achievement between groups given the four different presentations of information is rejected. In fact, there are highly significant differences.

### Summary

One-way analysis of variance revealed that as a group, the students in this study achieved significantly higher scores on the Map-Text Comparative Reading Test when given either the Word Text Presentation or Word plus Map Presentation of information, as compared with both the Integrated Word and Map Presentation and the Map Presentation. There were no significant differences between the mean scores for the group which received the Word Text Presentation as compared with the group which received the Word plus Map Presentation. Similarly, no significant difference was found between the mean scores of the groups given the Integrated Word and Map Presentation and the Map Presentation.

The results appeared to indicate that the presence of a map in social studies reading material does not assist a grade six student in gaining factual information. On the contrary, a map may be a source of confusion if the student must read it to gather all or a portion of the information he is seeking. The difficulty probably arises from a lack of well developed map reading skills as well as from an inability to relate information read from the map to that read from a written text.



IV. FINDINGS CONCERNING THE RELATIONSHIP OF THE VARIABLES SEX,  
MENTAL ABILITY, AND GENERAL READING ABILITY TO ACHIEVEMENT  
ON THE MAP-TEXT COMPARATIVE READING TEST

Since it has been assumed in this study that the four types of presentations used as parts of the Map-Text Comparative Reading Test, are typical of the way in which a great deal of social studies information is presented in reference books, it seemed to be in order to determine whether or not significant relationships exist between the ability to read such presentations and the variables sex, general reading ability, and mental ability.

The statistical procedure utilized for this purpose was regression analysis for two factors. The analysis of variance approach recommended by Hunka (1966, p. 5) when investigating the effects of such variables, is to first determine whether or not significant interaction exists between the treatments and variable(s) under study. Testing for the main effects of a variable such as sex, makes the assumption of homogeneity of regression (Foster, 1968, p. 5). If this is to be a valid assumption, the presence or absence of interaction should be determined.

If significant interaction is found to exist, it is meaningless to test for main effects (Hunka, 1966, p. 6). Therefore, the procedure followed in this study was to first test for interaction. If interaction was significant, further tests for the main effects of the variable(s) in question were not carried out. If there was no significant interaction, such tests were employed.





Findings Concerning Interaction between each of the Variables Sex, Mental Ability, and General Reading Ability and the Different Presentations of Information

Tests for the presence of significant interaction between each of the variables sex, mental ability, and general reading ability, and the four types of presentations of information on the Map-Text Comparative Reading Test were carried out by means of multiple regression analysis. In each instance a full and a restricted regression model were constructed. The restriction imposed was the exclusion of a set of cross product variables indicating interaction between either mental ability, sex, or general reading ability and the four types of presentations. The efficacy of prediction for each model was determined by calculating the squared multiple correlation coefficient ( $R^2$ ) between the criterion (the score on the Map-Text Comparative Reading Test) and the multiple predictors in each regression model. F ratios were then used to determine the significance of any differences found between full and restricted models.

Findings Concerning Interaction between Mental Ability and the Types of Presentation of Information. The full model used to test for the presence of interaction between the four types of presentation of information and mental ability was of the form:

$$y = a_1x_1 + a_2x_2 + a_3x_3 + a_4x_4 + a_5x_5 + a_6x_6 + a_7x_7 + a_8x_8 + a_9x_9 + e_1$$

where:

$y$  = the criterion, or score on the Map-Text Comparative Reading Test

$x_1$  = membership in the word text group

$x_2$  = membership in the word plus map group



$x_3$  = membership in the integrated word and map group

$x_4$  = membership in the map group

$x_5 = x_1 * x_9$  ) A set of cross product variables which

$x_6 = x_2 * x_9$  ) indicate interaction between presentation

$x_7 = x_3 * x_9$  ) type and mental ability

$x_8 = x_4 * x_9$  )

$x_9$  = mental ability

$e_1$  = error in the full model

A restricted model was derived by excluding the cross product variables from the full model. It was of the form:

$$y = a_1x_1 + a_2x_2 + a_3x_3 + a_4x_4 + a_9x_9 + e_2$$

The findings which are presented in Table XII indicate that the difference in the predictive ability of the full as compared with the restricted model is not significant. Therefore, it is justifiable to conclude that there is no significant interaction between mental ability and the type of presentation of information. Null hypothesis 2(a) is accepted. This means essentially that the bright child, as compared with the slow child will not perform relatively better or poorer on any of the type of presentation of information. Although both may perform better or poorer on the different presentations, the difference between the achievement of a bright and low child on any given presentation is constant.

Findings Concerning Interaction Between General Reading Ability and the Types of Presentation of Information. The full model used to determine the significance of interaction between the type of reading presentation and general reading ability consisted of predictor variables



TABLE XII

CONTRIBUTION OF PRODUCT VARIABLES WITH TOTAL SCORE ON THE  
MAP-TEXT COMPARATIVE READING TEST AS CRITERION

N = 200	$R_1^2$	$R_2^2$	df	F Ratio	Probability
Restriction	Full Model	Restricted Model			
Mental Ability by Treatment Interaction	0.40482	0.39970	3/191	0.5471	0.65063
Reading Ability by Treatment Interaction	0.36246	0.35838	3/191	0.4078	0.74758
Sex by Treatment Interaction	0.23315	0.19512	3/191	3.1578	0.02590*

\*significant at the .05 level of confidence





designating membership in each of the presentation groups, a variable for general reading ability which consisted of the combined score on the WM and PM Tests of SAT, and a set of product variables which indicated interaction between mental ability and each of the four types of presentation of information. The criterion was the score on the Map-Text Comparative Reading Test.

By excluding the product variables which indicated interaction between general reading ability and the type of presentation, a restricted model was constructed. The restricted model contained vectors for group membership as well as for general reading ability. Any significant difference in the squared multiple correlation coefficient ( $R^2$ ) between the criterion and the predictors in the full model and that in the restricted model was assumed to be attributable to the set of product variables indicating interaction.

The findings as presented in Table XII, indicate that the product variables did not significantly contribute to prediction of the criterion. It can be concluded that there was no significant interaction between general reading ability and the types of presentations. Therefore, null hypothesis 2(c) is accepted. In essence, this means that the difference in reading ability between the superior and poor reader is constant, regardless of the type of presentation of information.

Findings Concerning Interaction Between Sex and the Types of Presentation of Information. The presence or absence of significant interaction between sex and the types of reading presentations was also determined by multiple regression analysis. The predictors used in the full model were group membership in the various presentation groups, sex,



and a set of product variables which indicated interaction between sex and the types of presentation of information. The restricted model was derived by assuming that no differential effect existed between sex and the various presentations.

The findings, which have been reported in Table XII, page 107, indicate that there is significant interaction between sex and the types of presentation of information. Therefore, null hypothesis 2(b) is rejected. The value of  $F$  derived from a formula which used the squared multiple correlation coefficients between the full model and criterion, as well as between the restricted model and criterion was 0.5471. The probability associated with an  $F$  value of this magnitude was 0.0259 which is significant at the .05 level of confidence. The nature of the interaction is indicated in Figure 4.

As can be seen by referring to the graph, the differences in the performance of boys and girls for the Word Text Presentation and the Integrated Word and Map Presentation are not significant; thus are attributed to chance factors. The difference between performance by the two sexes on the Map Presentation is not significant at the .05 level of confidence, but approaches significance with a probability of 0.08 (Appendix A). The only presentation in which the difference in performance reaches significance is on the Word plus Map Presentation in which the mean difference in performance by the sexes is significant at the .01 level for a one-tailed test (Appendix A).

These results appear to suggest that the boys may be slightly more skilled in map reading (a point which the results only suggest, but do not prove), and therefore, more inclined than girls to attempt to make use of a map which accompanies a written text.





Criterion - Score on the Map-Text Comparative Reading Test

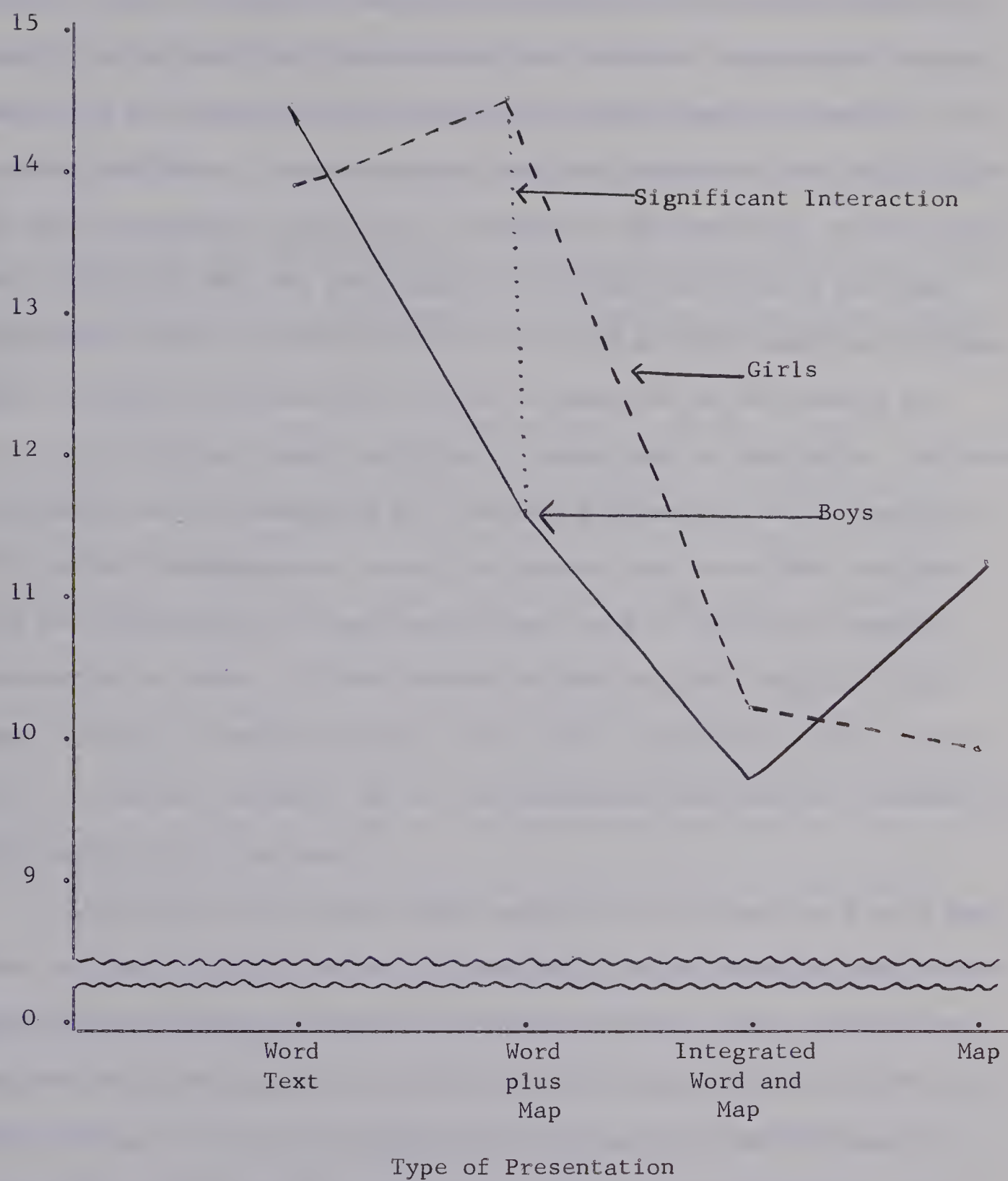


FIGURE 4

INTERACTION EFFECTS OF SEX AND TYPE OF PRESENTATION



The girls on the other hand appear to rely on their more highly developed skills, which in this instance were those required to read a written text. As Figure 4 indicates, the boys and girls performed about equally on the Word Text Presentation, but the boys' performance dropped sharply on the Word plus Map Presentation, even though the complete text was also available. It would appear that the presence of the map enticed the boys to attempt to rely on it, perhaps to the exclusion of the written text. The fact that the performance of the boys on the Word plus Map Presentation and on the Map Presentation, each of which employed the same map, was almost identical adds further evidence of an inclination by the boys to utilize a map, even when a verbal text is available. The boys' performance on the Integrated Word and Map Presentation which presented only partial information on a map, was poorer than for either the Word plus Map Presentation or Map Presentation, both of which had complete information on a map. If the assumption that boys were relying on the maps is valid, it would logically follow that they would perform poorly when the map was incomplete as in the Integrated Word and Map Presentation. This appears to be the case.

The girls, on the other hand, appeared to rely more on a word text than on a map to secure factual information. On the Word plus Map Presentation, which included complete information in both a word text and on a map, the girls did as well as on the Word Text Presentation. If the girls were relying solely on the verbal text, this would be expected as the same word text was used for the two presentations. However, when they could secure only partial information from the word text, as in the Integrated Word and Map Presentation, or were required to rely solely on a map, as in the Map Presentation, the girls' performance sharply



deteriorated.

The fact that there appeared to be almost exclusive use of either the map or text by the different sexes probably indicates an inability to relate the two types of presentations. Such a situation suggests that both sexes may not be getting all the factual information presented in word text and map combinations in the social studies reference books.

#### Findings Concerning the Main Effects of General Reading Ability and Mental Ability as Predictors of Achievement on the Map-Text Comparative Reading Test

In order to assess the main effects of a variable insofar as predicting a criterion is concerned, the assumption of homogeneity of regression or the absence of interaction must be valid (Foster, 1968, p. 5), (Hunka, 1966, p. 5). Since significant interaction was found to exist between sex and the types of presentation, sex was not included in testing for main effects. As a result hypothesis 3(b) could not be tested. Tests for the main effects of mental ability and general reading ability were carried out, however, as these variables were not found to interact significantly with the various presentations of information.

Mental Ability as a Predictor of Achievement on the Map-Text Comparative Reading Test. By means of multiple regression analysis and on an F test, the significance of mental ability as a predictor of achievement on the Map-Text Comparative Reading Test was determined. The measure of mental ability was provided by the scores on SCAT.

The full model included membership in the four presentation groups as well as mental ability as predictors. The restriction consisted of deleting mental ability as predictor in the restricted model. Utilizing





the squared multiple correlation coefficients for the full ( $R_1^2$ ) and restricted ( $R_2^2$ ) models, it was possible to determine whether or not a significantly better prediction of the criterion was possible when mental ability was included as a predictor in the regression equation.

The findings, shown in Table XIII, demonstrate the fact that mental ability is a highly significant predictor of achievement on the Map-Text Comparative Reading Test. The value of F is 66.56. An F value of this magnitude has an associated probability of 0.00000 which is significant beyond the 0.00001 level of confidence. Thus null hypothesis 3(a) is rejected.

The contribution of mental ability in terms of criterion variance can be expressed as a percentage. This is derived by first determining the difference in the squared multiple correlation coefficients for the full and restricted models ( $R_1^2 - R_2^2$ ) and multiplying it by 100. The results indicate that mental ability accounts for about 21 per cent of the criterion variance.

A significant relationship between a measure of mental ability, such as SCAT and achievement on a test which involves reading, such as the Map-Text Comparative Reading Test, is not surprising in view of the studies which have been carried out concerning the relationship between these variables. Bond and Wagner (1960, p. 129) cite evidence which demonstrates an increasingly significant relationship between mental ability and reading success at succeeding higher grade levels.

The relationship found in this study is less significant than is generally the case at this grade level. This situation can probably be attributed to the fact that the Map-Text Comparative Reading Test, taken as a whole (that is, all four types of presentation combined) is very



TABLE XIII

THE SIGNIFICANCE OF MENTAL ABILITY AND GENERAL READING ABILITY AS PREDICTORS OF  
ACHIEVEMENT ON THE MAP-TEXT COMPARATIVE READING TEST

Restriction	$R^2$		df	F Ratio	Probability
	Full Model	Restricted Model			
N = 200		$R^2_2$			
Mental Ability	0.39970	0.19373	1/194	66.5637	0.00000*
General Reading Ability	0.35838	0.19373	1/194	49.7831	0.00000*

\*significant at the .00001 level of confidence





different from the usual reading test. It requires not only the ability to read and comprehend words and sentences, but also maps. In addition, two of the presentations require the ability to relate words and a map together. Therefore, the findings in this study are probably more indicative of the value of mental ability as a predictor of the ability to read social studies reference books containing maps than of success on the usual type of standardized reading test.

#### General Reading Ability as a Predictor of Achievement on the Map-Text Comparative Reading Test

The significance of general reading ability as a predictor of achievement on the Map-Text Comparative Reading Test was determined by multiple regression analysis and an F test. A measure of general reading ability was provided by combining the scores on the WM and the PM Tests of SAT.

Group membership in the four presentation groups as well as a measure of general reading ability were used as predictors in the full model. The score on the Map-Text Comparative Reading Test was the criterion. The restriction imposed was the removal of general reading ability as a predictor in the restricted model.

The results, which are shown in Table XIII, indicate that general reading ability is a highly significant predictor of achievement on the Map-Text Comparative Reading Test. The value of F was 49.7831, which has an associated probability of 0.00000. This is significant at the .00001 level of confidence. Therefore, null hypothesis 3(c) is rejected. Expressed as a percentage, general reading ability accounts for about 16 per cent of criterion variance.



An interesting point brought out by the findings in this section, was that mental ability, as measured by SCAT, is a better predictor of achievement on the Map-Text Comparative Reading Test than reading ability as measured by the WM and PM Tests of the SAT. This can probably be explained by the fact that SCAT is both a verbal and nonverbal test, whereas the measure of general reading ability which was used was taken from purely verbal tests. Since the Map-Text Comparative Reading Test is only partly verbal, it is understandable that a purely verbal reading test is not a more significant predictor than a mental ability test which has both verbal and nonverbal sections.

#### V. OBSERVATIONS MADE WHILE TESTING WITH THE MAP-TEXT COMPARATIVE READING TEST WAS IN PROGRESS

This section of the chapter is concerned with the observations made when the Map-Text Comparative Reading Test was administered. The first set of observations were concerned with the techniques used by students in reading social studies discourse containing word and map presentations. The second set of observations concerned the amount of time taken by the students to complete the different presentations. The latter is discussed in relation to the level of achievement of the various groups which was reported earlier in the chapter.

#### Findings Concerning the Techniques Used by the Students in Reading Presentations Containing both a Text and a Map

Informal observations were made and recorded while testing was in progress in order to determine whether or not the students, as a group, used any particular technique in reading a presentation which contained





both a map and written text. Since only two of the groups (the Word plus Map group, and the Integrated Word and Map group) had both a text and map, the observations were confined to these students.

It was very difficult to discern any particular pattern or technique insofar as a sequence of activity or emphasis on the map or written text was concerned. Almost without exception, the students went through the test quickly page by page to the end. With the exception of this quick overview, as far as the investigator could determine, there was no common approach or reading technique used by any substantial number of the students under study. Lack of detection of common reading techniques may have been the result of an ineffective system of observation. However, on the basis of the findings, it must be tentatively concluded that, as a group, the grade six students in this study did not employ any unique reading technique in attempting to gain factual information from presentations which contained both a map and a written text.

#### The Time Taken for Completion of the Map-Text Comparative Reading Test by the Four Presentation Groups

Prior to the commencement of testing with the Map-Text Comparative Reading Test, the students were instructed to work as quickly as possible without sacrificing accuracy. These directions were assumed to be typical of the type given in a regular classroom situation when students are seeking factual information from social studies reference books containing map and/or text presentations.

By recording the time taken by each student to complete the Map-Text Comparative Reading Test, an attempt was made to determine student efficiency in terms of speed. However, speed is not the only requirement





for efficiency. Accuracy is also an important requirement. The ideal situation would be one in which a student could function with a high degree of accuracy and speed. With this in mind, the findings in this section have been interpreted in light of the performance of the students on the various presentations of the Map-Text Comparative Reading Test which were reported earlier in this chapter.

The mean score for each presentation group in terms of the number of minutes taken to complete the Map-Text Comparative Reading Test appears in Table XIV. In order to give an indication as to the degree of dispersion of the scores within each of the groups, the standard deviation for each group has been reported.

TABLE XIV

THE TIME TAKEN BY EACH OF THE PRESENTATION GROUPS TO  
COMPLETE THE MAP-TEXT COMPARATIVE READING TEST

Group	Number of Students	Mean Score in Minutes	Standard Deviation
Word Text Presentation	50	26.03	7.65
Word plus Map Presentation	50	28.68	6.08
Integrated Word and Map Presentation	50	29.06	8.25
Map Presentation	50	21.40	6.75

The results indicate, that in terms of group means, the presentations which contained both a map and word text took longer to complete, as compared with the presentations which had either a map or word text.



This is understandable in that presentations containing both a map and word text necessitate the use of two sets of reading skills. A further complication which probably slows down the reading process is the need to make both physical and mental adjustments in moving from the map to the word text, or from the word text to the map.

It was suggested earlier in this chapter that the results appeared to indicate that the students tended to avoid the difficulties of relating information from the map and text together by relying primarily on one or the other as a source of information. This did not detract from achievement for the Word plus Map group as a whole, insofar as a comparison with the Word Text group was concerned. However, if efficiency is viewed as a matter of speed as well as accuracy, the presence of the map in the Word plus Map Presentation seems to have increased the time required for completion of the test questions. Students in the Word plus Map group took an average of about two and one-half minutes longer to finish the Map-Text Comparative Reading Test than the students in the Word Text group. Therefore, even if a student does not make use of both a map and word text when they are provided, the very fact that the two are presented in combination appears to detract from the speed of performance.

In terms of efficiency, the Integrated Word and Map group could be considered the least efficient of the four presentation groups. Not only did this group have the lowest mean score on the Map-Text Comparative Reading Test as reported previously in this chapter, but the mean completion time was greater than that of the other three presentation groups.

There are probably several reasons for this relative lack of efficiency on the part of the Integrated Word and Map Presentation group.





Unlike the Word plus Map group, this group had to read both the map and text to gain full information. As pointed out in Chapter Two, reading a combined presentation requires not only the reading skills needed for map reading and word reading, but also physical and mental skills in adjusting from one type of communication medium to the other. As a group, the students who were given this presentation have not apparently developed such skills to an adequate level in terms of accuracy and speed of performance.

Although the group which was given the Map Presentation had a mean completion time of more than four and one-half minutes faster than any other group, the achievement mean of the group was one of the lowest. The Map group had a significantly lower mean achievement score than either the Word Text group or the Word plus Map group. This suggests that the map reading skills of the students in the study were not well developed as compared with the word text reading skills. The relative speed with which the group operated is probably related to the value of a map as a summarizer of information. The students came up against the problem of using map reading skills very quickly, simply because there was no text to occupy their attention. Thus success or failure in reading the map was a rather immediate phenomenon, resulting in rapid completion time.

The preceding discussion which involved time comparisons must be regarded as speculative and purely suggestive. The speculation is necessary because the significance of the differences between the mean completion times has not been established by statistical analysis. All statements based on the results of mean achievement scores for the various groups are less subject to error as the significance of differences



between group mean scores on the Map-Text Comparative Reading Test has been established statistically. These results were reported in a previous section of this chapter.

## VI. SUMMARY

The first part of this chapter dealt with the quality of the final draft of the Map-Text Comparative Reading Test as a testing instrument. The criteria used to judge its value were reliability, difficulty, and validity. Test reliability was at an acceptable level, with a Kuder-Richardson formula 20 coefficient of .70 (Guilford, 1965, p. 104). The majority of the items had difficulty indices between 0.400 and 0.699. This is desirable, in that items of medium difficulty maximize individual differences. Content validity was claimed for the test items, in that they appear to be typical of the type of factual questions which frequently appear in social studies reference books. If content validity is assumed, then a type of construct validity can be claimed to the extent that an item measures the same thing as the test as a whole. The validity indices were at an acceptable level, with only a single item having a validity index below 0.300 (Garrett, 1953, p. 368).

The second part of the chapter presented the findings of a one-way analysis of variance and the interpretation of these findings. Highly significant differences were found between the mean scores of the randomly selected groups which were the Word Text Presentation or the Word plus Map Presentation as compared with either the group given the Map Presentation or the Integrated Word and Map Presentation. However, no significant differences were found between the Word Text Presentation and the Word plus Map Presentation, or the Integrated Word and Map





Presentation and the Map Presentation. These results were interpreted as indicating that the value of a map in social studies reference books is not being realized by the students in this study. The students perform just as well, or even better when given a word presentation without a map. In fact, a map appears to be a source of confusion for these students as a group when they are required to read it in order to gain full information to answer factual questions. The difficulty was attributed to a lack of well developed map reading skills, and an inability to relate a map and word text together in a meaningful manner.

The third section of the chapter presented the findings and interpretations concerning the relationship between the variables sex, mental ability, and general reading ability, and achievement on the Map-Text Comparative Reading Test. Two types of relationships were examined. First, by means of multiple regression analysis, significant interaction was found between the Word plus Map Presentation and sex. Interaction between sex and the Map Presentation approached significance also. The other variables did not interact with the types of presentations of information, and were therefore, tested for main effects as predictors of achievement on the Map-Text Comparative Reading Test. Both general reading ability and mental ability were found to be highly significant predictors of such achievement. They accounted for about 16 and 21 per cent of criterion variance respectively.

The findings concerning the presence of significant interaction between sex and the type of presentation, were interpreted as an indication that the boys as a group may have been more inclined to utilize a map, and the girls, a word text in situations where both were available. This alleged trend toward exclusive use of one or the other type of presentation was attributed to an inability by both sexes, to do the two types of





presentations together.

Although mental ability was found to be a significant predictor of achievement on the Map-Text Comparative Reading Test, the relationship between the two was not as highly significant as has been found in other studies between mental ability and reading at the sixth grade level. This was explained by pointing out that the Map-Text Comparative Reading Test is not a usual type of reading test, but rather one requiring the use of a number of specialized reading skills. General reading ability was also a highly significant predictor of achievement on the Map-Text Comparative Reading Test. However, the strength of the relationship appeared to indicate that while success in reading social studies materials requires well developed basic reading skills, a number of specialized reading skills are also required when maps are presented in social studies books.

The last major section of the chapter was concerned with the results of observations which were made at the time of testing with the Map-Text Comparative Reading Test. An attempt by the investigator to determine whether or not any particular technique was used by the students as a group to read presentations containing both a word text and map was unsuccessful. It was suggested that this lack of concrete results might be the results of an inadequate approach to observation. The second part of the section dealt with the amount of time taken by each group to complete the questions on the Map-Text Comparative Reading Test. It was found that the combined presentations both took longer to complete than either the Word Text or Map Presentations. This was attributed to the need to use two sets of reading skills, and to make physical and mental adjustments between the two types of presentations.



However, the findings were interpreted in terms of efficiency which is a matter of accuracy as well as speed. The mean scores for each presentation group as reported in a previous part of Chapter V were referred to in this connection. When both criteria were considered, the relatively great speed with which the Map Presentation was completed was much less impressive, as the mean achievement score for that presentation group was significantly lower than either the Word Text or Word plus Map Presentation groups. The relative speed of completion was probably the result of the immediate encounter of the reader with the requirement to use certain reading skills. If these are well developed, they are used quickly. If they are not, failure is acknowledged quickly. The Integrated Word and Map Presentation was considered least efficient according to the criteria used. This was attributed to a lack of skill in utilizing all the reading skills needed plus the need to make many adjustments while reading. The Word Text Presentation group was probably the most efficient: they were the second fastest and the most accurate. The Word plus Map group were the second slowest, but were about the same in accuracy as the Word Text Presentation Group.





## CHAPTER VI

### SUMMARY, FINDINGS, CONCLUSIONS, IMPLICATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

This chapter has been organized into five sections. The first section is a general summary of the study. The second and third sections present the findings and conclusions. Implications of the findings for educational practice are dealt with in part four. While conducting the study, several possibilities for further research in this area became apparent to the investigator. These are given in the last section of the chapter.

#### I. SUMMARY OF THE STUDY

The major purpose of this investigation was to determine whether or not the presence of combined map and word text presentations in social studies reference books pose reading problems for grade six students in addition to those encountered in reading a word text or map as distinct entities.

In addition, an attempt was made to determine the nature and extent of any relationship which might exist between each of these variables (sex, general reading ability, mental ability) and the ability to read the various map and/or text presentations of factual information.

In order to assess the ability of the students to read these presentations, a test was constructed and designated the Map-Text Comparative Reading Test. The test was made up of four different types of presentation which included: a word text presentation; a word plus map presentation, each of which contained information; an integrated



word and map presentation, each of which contained partial information, but together presented complete information; and a map presentation. Each type of presentation included all of the information required to answer a series of twenty factual questions.

The Map-Text Comparative Reading Test as well as the SCAT, and the WM Test and PM Test of SAT were administered to a group of 200 grade six students living in a small city in a rural area, in May 1968.

This group of students was divided into four groups, each containing fifty students. Each group was given a different presentation of the Map-Text Comparative Reading Test. Informal observations were made while the Map-Text Comparative Reading Test was being written in an effort to determine the procedure followed by students in reading social studies material of the type found in this test. The time at which each student finished the test was also recorded.

A one-way analysis of variance was used to examine the significance of any differences between the mean scores of the groups. In this manner an attempt was made to determine the comparative ability of students to read the types of presentations of information which frequently appear in their social studies reference books.

Multiple regression analysis was used to determine whether or not there was a relationship between each of the variables sex, general reading ability, mental ability, and achievement on the Map-Text Comparative Reading Test. The different variables were first tested for interaction with the various presentations. If no significant interaction was found, tests for main effects were utilized to determine whether or not the variables were significant predictors of achievement





on the Map-Text Comparative Reading Test.

## II. FINDINGS

A number of questions were formulated to direct the investigation. An attempt was made to answer some of these questions by observation while testing was in progress, while others were to be answered by means of statistical analysis. Those which were to be answered by means of statistical procedures were stated in terms of null hypotheses. A brief discussion concerning the findings and status of these hypotheses is found in the first part of this section, while a discussion of the results of the observations are discussed in the second part.

### Null Hypothesis 1

There is no significant difference in the reading achievement of randomly selected groups of grade six students on tests which present information in a:

- (a) Word Text Presentation
- (b) Word plus Map Presentation
- (c) Integrated Word and Map Presentation
- (d) Map Presentation

A one-way analysis of variance indicated that there were highly significant differences in the ability of grade six students to read the various presentations. The findings indicated that the students read the Word Text and Word plus Map Presentations with about equal success. Similarly, they read the Integrated Word plus Map Presentation and the Map Presentation about equally well. However, the students read the first





two presentations better than the latter two: the differences were highly significant. Therefore, the null hypothesis was rejected.

It appeared that the students as a group were very skillful in reading a verbal text, as compared with the other types of presentations which are typically found in social studies reference books. When they were required to rely on a map, or a map and text presentation for factual information, however, their reading performance deteriorated significantly.

### Null Hypothesis 2

There is no significant interaction between the type of reading presentation of information and the:

- (a) mental ability
- (b) sex
- (c) general reading achievement of students

This hypothesis was tested by means of regression analysis. The results indicated that there was no significant interaction between the four types of presentations of information and either (a) mental ability or (c) general reading achievement. Therefore, the null hypothesis is accepted for these two variables.

However, the results indicated that there was significant interaction between the Word plus Map presentation and (b) sex. For this presentation, the girls, as a group, scored significantly higher than the boys. For the Map presentation, the interaction with sex was approaching significance, with the boys' group mean being higher than the girls. Therefore, the null hypothesis is rejected insofar as sex is concerned. This finding precludes the testing of null hypothesis 3(b) which concerns the main effects of sex as a predictor of social studies reading



achievement.

### Null Hypothesis 3

The following variables are not significant predictors of the achievement of grade six students on a test which measures the ability to read social studies discourse containing a map and/or printed word text:

(a) mental ability

(b) sex

(c) general reading ability

For variable (a) mental ability, as measured by SCAT Form 4A, the null hypothesis is rejected. By means of multiple regression analysis, it was possible to determine the significance of mental ability as a predictor of achievement on the Map-Text Comparative Reading Test. It was assumed that this test was an adequate instrument for measuring the ability of students to read social studies discourse containing a map and/or verbal text. The findings indicated that mental ability was a highly significant predictor of achievement on the Map-Text Comparative Reading Test. In terms of per cent, it accounted for 21 per cent of the variance..

The null hypothesis was not tested for variable (b) sex, because of the presence of significant interaction between sex and the presentations of information. According to Hunka (1966, p. 6), if significant interaction is found between two variables, it is meaningless to test for main effects.

Variable (c) general reading achievement, as measured by the WM and PM Tests of SAT Form W, was found to be a highly significant predictor of achievement on the Map-Text Comparative Reading Test. In terms of per cent, general reading achievement accounted for about 16 per cent of the





variance. Therefore, the null hypothesis is rejected for this variable.

#### Summary of Findings Concerning the Null Hypotheses

Three null hypotheses were tested in this study. Null hypotheses 2 and 3 each included three variables which were tested individually. The statistical procedures employed were a one-way analysis of variance for null hypothesis 1 and multiple regression analysis for null hypotheses 2 and 3.

The findings indicated that there were significant differences in the ability of grade six students to read different types of verbal text and/or map presentations of factual information. Thus null hypothesis 1 was rejected.

Multiple regression analysis revealed no significant interaction between either mental ability or general reading ability and the various presentations of information. Therefore, null hypotheses 2(a) and 2(c) were accepted. However, both of these variables proved to be significant predictors of achievement on the Map-Text Comparative Reading Test. Mental ability accounted for 21 per cent of the variance, while general reading achievement accounted for about 16 per cent. Therefore, null hypotheses 3(a) and 3(c) were not tenable. The variable, sex, however, was found to interact significantly with the types of presentation of information. As a result, null hypothesis 2(b) was untenable, and null hypothesis 3(b) was not tested.

### III. CONCLUSIONS

1. As a group, the grade six students who were the subjects in this study were significantly more skillful in reading factual information



from a word text than from either a map or combination of word text and map. This leads to the conclusion that the students had not sufficiently developed the basic map reading skills, such as the calculation of distance by use of the scale.

2. The fact that the group which had both a complete map and complete word text performed less well than the group that had only the word text, indicated that the students may not have been able to use what information they could read from a map to clarify or reinforce the verbal text. Instead, the map may have been a source of confusion.

3. The boys appeared to prefer to attempt to gain factual information from a map, and the girls from a word text, when given a choice. This may be related to a basic spatial orientation by boys and a verbal orientation by girls.

4. The ability to read for factual information in social studies materials containing maps and/or word texts requires reading skills in addition to those used in reading narrative material. This conclusion is based on the finding that general reading achievement accounted for less than one-fifth of criterion variance in predicting achievement on a test which is assumed to be typical of much social studies discourse.

5. Mental ability acted as a main effect. The relative standing of a bright or dull child did not significantly change according to the type of presentation. From this, it can be concluded that social studies books containing maps, or combined map and word presentations may not be differentially easier or more difficult for one mental ability group as compared with others.

6. General reading ability also acted as a main effect. The relative standing of a good or poor reader did not change according to





the type of presentation of information. Therefore, it can be concluded that social studies books containing maps and combined word and map presentations of information are not differentially easier or more difficult for the good or poor reader.

7. A highly speculative conclusion concerns the relative speed with which grade six students read the various types of presentations used in this study. While maps in social studies books may speed up the rate at which a student locates information, the information obtained may not be as accurate as that which could be gained from a written text.

#### IV. EDUCATIONAL IMPLICATIONS

The findings of this study and their attendant conclusions suggest a number of implications.

##### Implication for Teaching

1. The findings of this study indicate that the grade six students used as subjects in this study, are lacking in the development of fundamental map reading skills. This judgment is based on a comparison of the results of the Map Presentation section of the Map-Text Comparative Reading Test with the expectations of skill development which are given in the Elementary Curriculum Guide for Social Studies-Enterprise. Since the present map reading program as presented by the Elementary Curriculum Guide for Social Studies-Enterprise appears to be comprehensive, it is in order to recommend that teachers place more emphasis on this part of the elementary social studies program.

2. A second finding which has relevance for classroom practice is that concerning the apparent lack of ability by the students to





meaningfully relate a word text and map together in order to fully utilize the potential of each type of presentation. This situation suggests that teachers should provide actual practice for students in the skills required for reading combined map and word text presentations. Such skill development might include practice in looking to the map to clarify specific facts presented in the word text immediately after reading such facts in the text.

3. If the findings concerning the presence of significant interaction between sex and the Word plus Map Presentation of the Map-Text Comparative Reading Test have been properly interpreted in this study, they give rise to further implications for classroom instruction. The results appeared to indicate that the boys, when given a choice would attempt to use the map to answer questions, whereas the girls would use the word text. Perhaps the boys were more willing to take a chance with a type of presentation they had not completely mastered. The girls were less inclined to take such a chance and used established skills. This suggests that in practice, perhaps more attention should be directed to differential emphasis in instruction by sex. Perhaps girls as a group should be encouraged to attempt to read maps more often as they appeared to be somewhat hesitant in doing so in this study.

One implication arising from the situation seems relatively clear. If the students as sex groups, are inclined to use one form of presentation to the exclusion of the other, the value of the combined word text and map presentation would be lost. Therefore, teachers must be made aware of the need to teach students not only to read factual material from maps and word text as separate presentations, but also how to use such presentations in combination.



4. Another implication which is related to those previously presented is that the reading skills required to read social studies presentations containing maps and/or word texts do require skill development in addition to basic reading skills used in much everyday reading, and require special teaching attention even to the brighter students. Teachers are often inclined to feel that the superior reader or bright student will automatically develop all the reading skills required for any type of reading. In spite of the fact that such students would probably have an advantage in learning the more specialized reading skills, the fact that they have scored well in reading and/or in mental ability tests does not guarantee success in reading social studies information containing map and/or text presentations. This point was demonstrated by the finding that although both general reading ability and mental ability as measured by standardized tests were significant predictors of success in reading map and/or text presentations, neither of these variables accounted for more than a fifth of the criterion variance.

#### Implications for the Production, Purchase, and Use of Social Studies Materials

Since the students in this study did not appear to make full use of maps or combinations of maps and word texts when reading materials representative of much of the discourse found in social studies books, it might appear that the inclusion of such materials in social studies books is a waste of time, money, and effort. However, the value of a map as a summarizer of information should not be ignored. This point was made by Wesley and Adams (1952, p. 358) when they stated:

. . . Imagine the difficulty of trying to describe in words the eastern shore line of the United States, the shape of Kentucky or the relative





positions of Lake Michigan and the Gulf of Mexico. Try to put into words all the information that can be gleaned from one simple Map.

This quote indicates the value of maps. It would appear then that insofar as teaching materials for elementary school children are concerned, authors should keep maps easy to understand, but should continue to use them. The responsibility for ensuring that students are able to utilize the potential value inherent in maps rests on the educators who write the books, and the educators who teach reading skills for social studies.

#### Implications for Supervisors and Administrators

1. At the upper elementary level, the need to read in the content fields begins to arise with the need for the skills discussed in this study really becoming most apparent at the fifth and sixth grade levels. However, it is also at these grade levels that many schools are departmentalizing by subjects to an increasing degree. Therefore, the assignment of responsibility for teaching not only map reading, but combined map and word text reading to particular teachers becomes necessary. Should this be done by the reading teacher or the social studies teacher? Should the responsibility be shared? These questions must be resolved and teachers made aware of their responsibilities. The designation of responsibility is a problem of coordination; therefore, it is the responsibility of administrators or supervisors.

2. Educators in supervisory capacities should provide leadership in stressing the importance and value of a comprehensive and sequential map reading program as recommended by the Elementary Curriculum Guide for Social Studies-Enterprise. Inservice work stressing such skills would probably be beneficial.



### Implications for Curriculum Committees

Although the Elementary Curriculum Guide for Social Studies-Enterprise presents a very comprehensive program in map reading, neither that publication nor A Reading Handbook makes any specific reference to the need for instruction in reading materials which include both a word text and map in combination. The publication, A Reading Handbook, does make general reference to the need to develop ability to gain information from sources such as textbooks, references, encyclopedias, and graphic materials, but such a general statement would probably not alert educators to the need mentioned above.

### V. SUGGESTIONS FOR FURTHER RESEARCH

During the course of work on this thesis a number of possibilities for further research in related areas became evident to the investigator:

1. A study similar in structure to this one could be carried out, using graphs, pictures, or tables in conjunction with written texts. They might help to clarify whether or not the findings in this study apply only to maps or to other graphic materials as well.
2. A similar study carried out with a population at either a higher or lower grade level might provide information as to similarities and differences in reading skills of this type at various grade levels.
3. This study dealt with literal comprehension of both word and map presentations of information. A similar study could explore the level of skill development insofar as interpretive skills are concerned.
4. A study similar to this one could be carried out with students from a different type of geographical locality. This study was carried out in a small city. The results of a similar study carried on in a





large urban centre or in a rural area would help to clarify the extent to which the findings of this study can be generalized.

5. A study which provided the same factual information in words and in some type of graphic material could be undertaken to further explore preferences and achievement along sex lines. This study has suggested that, when given a choice, boys tend to use a map, while girls choose a word text as a source of information.

6. A study could be undertaken to determine whether or not students as a group utilize any particular technique in reading combined word and map presentations. This study attempted to answer this question, but failed to do so adequately due to the lack of an effective system of observation. Such a study might serve to clarify the interpretation of the findings reported in this study.

7. There are probably a number of other significant predictors besides general reading ability, mental ability, and sex, either as separate variables or as product variables, which would be indicators of probable success in reading information in maps and words. A step-wise regression analysis, utilizing the results of a test similar to the Map-Text Comparative Reading Test as the criterion, could determine the contributions of such variables.





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## APPENDIX A





MULTIPLE REGRESSION MODELS USED TO TEST FOR INTERACTION  
BETWEEN GENERAL READING ABILITY AND THE TYPES OF  
PRESENTATION OF INFORMATION

$$\text{Full Model: } y = a_1x_1 + a_2x_2 + a_3x_3 + a_4x_4 + a_{10}x_{10} + a_{11}x_{11} + a_{12}x_{12} + a_{13}x_{13} + a_{14}x_{14} + e_3$$

where:  $y$  = the criterion, or score on the Map-Text Comparative Reading Test

$x_1$  = membership in the word text group

$x_2$  = membership in the word plus map group

$x_3$  = membership in the integrated word and map group

$x_4$  = membership in the map group

$x_{10} = x_1 * x_{14}$       )    A set of product variables which indicate

$x_{11} = x_2 * x_{14}$       )    interaction between presentation type

$x_{12} = x_3 * x_{14}$       )    and general reading ability

$x_{13} = x_4 * x_{14}$       )

$x_{14}$  = general reading ability

$e_3$  = error in the full model

$$\text{Restricted Model: } y = a_1x_1 + a_2x_2 + a_3x_3 + a_4x_4 + a_{14}x_{14} + e_4$$

where:  $e_4$  = error in the restricted model



MULTIPLE REGRESSION MODELS USED TO TEST FOR INTERACTION BETWEEN SEX AND  
THE TYPES OF PRESENTATION OF INFORMATION

$$\text{Full Model: } y = a_1x_1 + a_2x_2 + a_3x_3 + a_4x_4 + a_{15}x_{15} + a_{16}x_{16} + a_{17}x_{17} + a_{18}x_{18} + a_{19}x_{19} + e_5$$

where:  $y$  = the criterion, or score on the Map-Text Comparative Reading Test

$x_1$  = membership in the word text group

$x_2$  = membership in the word plus map group

$x_3$  = membership in the integrated word and map group

$x_4$  = membership in the map group

$x_{15} = x_1 * x_{19}$  ) A set of product variables indicating

$x_{16} = x_2 * x_{19}$  ) interaction between sex and the types

$x_{17} = x_3 * x_{19}$  ) of presentation

$x_{18} = x_4 * x_{19}$  )

$x_{19}$  = sex

$e_5$  = error in the full model

$$\text{Restricted Model: } y = a_1x_1 + a_2x_2 + a_3x_3 + a_4x_4 + a_{19}x_{19} + e_6$$

where:  $e_6$  = error in the restricted model



## APPENDIX B





Information Deleted from Presentation 3, the Integrated Word and Map Presentation  
as Compared to Presentation 2, the Word plus Map Presentation

Topic: Vegetation Regions of Canada

Map Deletions: The words "Treeline", "Newfoundland", and "Churchill".

Word Text Deletions: The words " . . . about 1400 miles . . . " from sentence two, paragraph two.

The sentence "The Mountain Forest extends across the dry interior uplands of British Columbia and the eastern slopes of the Rocky Mountains into Alberta" from sentence two, paragraph six.

Topic: Surface Features of British Columbia

Map Deletions: The words "Lower Fraser Valley" and the numerals 50°, 55°, and 60°.

Word Text Deletions: The paragraph "The northern corner of British Columbia lies to the east of the Rockies and is part of the Great Plains of North America. It is a high rolling plain in which deep, narrow valleys have been cut by the Peace, Fort Nelson, and Liard Rivers" which is paragraph two in Presentations 1 and 2.

The words " . . . average fifty miles in width in the south . . . " from sentence two, paragraph three.

The sentence "The Peace River is the only one which flows to the east" from sentence three, paragraph four.

Topic: The River Systems of the Prairie Provinces

Map Deletions: The words "Lake Winnegosis", "Lake Manitoba", and "Athabasca River".

Word Text Deletions: The word " . . . east . . . " from sentence one, paragraph two.

The numeral and word " . . . 1000 miles . . . " from sentence one, paragraph four.



Information Deleted from Presentation 3 (continued)

Topic: Mining in New Brunswick and Nova Scotia

Map Deletions: The words "Cumberland County", "Pictou County" and "Windsor".

Word Text Deletions: The sentence "The Minto coal mines near Grand Lake are probably the oldest in North America, and records exist of shipments of coal to Boston as early as 1639" from paragraph one. The sentence "In the central part of the province there are large deposits of gypsum which is used in the manufacture of plaster of Paris and wallboard" formerly sentence one, paragraph five.





DIRECTIONS FOR THE MAP-TEXT COMPARATIVE READING TEST

1. Do not turn this page until you are told to do so.
2. Read these directions silently, as I read them aloud.
3. You should have on your desk a separate answer sheet.  
Fill in the information listed at the top of this  
answer sheet: name, age, male or female, date of birth,  
and assigned group number.
4. Do not make any marks on the test. You will blacken in  
the proper space on the answer sheet to match the answer  
you have chosen - A, B, C, or D. Check to be sure you  
have found the number on the answer sheet which matches  
the number of the question you are answering.
5. You are all answering the same questions. However, the  
information you need is presented in different ways.  
If you are in Group 1, you will not have any maps.
6. The test is divided into four sections dealing with  
Canadian geography. After each topic is presented,  
you will find five questions dealing with the topic.  
Therefore, when you have completed the test, you will  
have answered twenty questions.
7. You do not have a time limit, but work as quickly and  
carefully as you can.
8. If you have any questions, please raise your hand.
9. Ready? Begin.



## VEGETATION REGIONS OF CANADA

The Northern Coniferous Forest (Boreal Forest) stretches across the central part of Canada from Newfoundland to the Yukon. Spruce, pine, fir, poplar, and birch grow in this forest, and from it are cut the logs for Canada's pulp and paper industry which provides about half of the world's newsprint.

The northern part of the Northern Coniferous Forest is a Transition Forest with fewer and smaller trees. Beyond the treeline, which begins near the mouth of the Mackenzie River and extends southeast about 1400 miles to Churchill, Manitoba, around the shores of Hudson and James Bays, northward across the Ungava region of Quebec, and then south again along the Labrador coast, the forest dwindles away in the barren tundra of the Arctic.

On its southern edge the Northern Coniferous Forest begins to include a greater number of deciduous trees and gives way gradually to other forest regions. The Great Lakes-St. Lawrence Forest extends through Southern Ontario and Quebec and is also a region of change from the conifers of the Northern Coniferous Forest to the great hardwood forests of eastern United States. In this forest grow oak, maple, beech, ash, elm, walnut, butter-nut, and many other species.

The Acadian Forest of the Maritime Provinces is similar to the Great Lakes-St. Lawrence Forest, but it has more evergreen trees, especially red pine which grow well in the moist climate.

In the Prairie Provinces the Northern Coniferous Forest changes into a mixed wood forest with trees such as poplar, elm, ash, and Manitoba maple. In the drier areas the forests become parklands. Finally the trees give way to the grassy prairies.

The heavy rainfall on the west coast aids the growth of the huge trees, such as western red cedar, Sitka spruce, and Douglas fir, of the Coast Forest. The Mountain Forest extends across the drier interior uplands of British Columbia and the eastern slopes of the Rocky Mountains into Alberta. While the southern part has a scattering of hardwoods such as poplar, maple, and oak, this forest is made up mainly of cedar, spruce, fir, hemlock, larch, and pine of many varieties.



Questions: Vegetation Regions of Canada

Choose the correct answer and blacken in the proper space on the answer sheet.

1. The eastern limit of the Northern Coniferous Forest is found in which of the following?
  - A. Newfoundland
  - B. Quebec
  - C. Yukon
  - D. British Columbia
2. What type of forest is found immediately north of the Northern Coniferous Forest?
  - A. Mountain Forest
  - B. Transition Forest
  - C. Deciduous Forest
  - D. Mixed Forest
3. From the mouth of the Mackenzie River to the town of Churchill, Manitoba, the treeline heads in what direction?
  - A. northwest
  - B. southwest
  - C. southeast
  - D. northeast
4. The distance between the mouth of the Mackenzie River and Churchill, Manitoba is about
  - A. 1000 miles
  - B. 1400 miles
  - C. 1750 miles
  - D. 2000 miles
5. What type of forest covers most of the central part of Canada?
  - A. Mountain Forest
  - B. Transition Forest
  - C. Northern Coniferous Forest
  - D. Mixed Forest





## SURFACE FEATURES OF BRITISH COLUMBIA

Except for a small area east of the Rocky Mountains, British Columbia is a huge sea of mountains and plateaus. The Cordillera, a mountainous region that stretches from the southern tip of South America to Alaska, occupies most of the province. Two great mountain systems, the Rocky Mountains on the east and the Coast Mountains on the west, extend throughout its entire length. Between them lie the Interior Uplands.

The northern corner of British Columbia lies to the east of the Rockies and is part of the Great Plains of North America. It is a high, rolling plain in which deep, narrow valleys have been cut by the Peace, the Fort Nelson, and Liard Rivers.

The Rocky Mountains, in Canada, extend from the United States border (49th parallel) to the valley of the Liard River and form part of the Alberta-British Columbia boundary. These high, sharp-peaked mountains average fifty miles in width in the south and form a succession of ridges and peaks, many of which are covered with snow the year round.

A deep valley from two to ten miles wide called the Rocky Mountain Trench lies just west of the Rockies. The floor of the trench is quite rough, and in some places there are marshes. The headwaters of the Columbia, the Fraser, and the Peace Rivers rise in this valley. The Peace River is the only one which flows to the east.

A high, dry region, the Interior Uplands, lies between the two mountain systems in the shelter of the Coast Mountains. These uplands consist of plains, low mountains, and deep valleys. The plains, for the most part are covered with grass, and the low slopes are lightly wooded.

In the heavily populated southwestern corner of the province is the Lower Fraser Valley, British Columbia's most fertile region. It is a low plain at the mouth of the Fraser River that was built up of sediment carried down by the Fraser and deposited when the river reached the flat surface near the coast.

The Coast Mountains rise along the coast like a large wall of granite broken by deep valleys such as those of the Fraser, the Stikine, and Skeena Rivers. Luxuriant forests of very tall trees grow on the slopes of these mountains.

A chain of islands, varying in size from Vancouver Island with an area of 13,000 square miles to tiny ones of a few acres, extends along the coast. These islands are part of the Insular Mountain system, much of which lies beneath the sea. Many of the islands are heavily wooded. The southeastern part of Vancouver Island has fertile farm land.



Questions: Surface Features of British Columbia

Choose the correct answer and blacken in the proper space on the answer sheet.

6. What parallel of latitude forms the southern boundary of British Columbia?
- A. 60th
  - B. 50th
  - C. 49th
  - D. 55th
7. Which of these rivers does not flow through the Coast Mountains?
- A. Skeena
  - B. Fraser
  - C. Stikine
  - D. Fort Nelson
8. The average width of the Rocky Mountains is about
- A. 5 miles
  - B. 50 miles
  - C. 500 miles
  - D. 5000 miles
9. What is the name of the river valley in the southwestern corner of British Columbia?
- A. Kootenay River Valley
  - B. Skeena River Valley
  - C. Peace River Valley
  - D. Lower Fraser Valley
10. Which of the rivers that rise in the Rocky Mountains flows in an eastward direction from its source?
- A. Columbia
  - B. Fraser
  - C. Skeena
  - D. Peace





## THE RIVER SYSTEMS OF THE PRAIRIE PROVINCES

Water is precious in the West where rainfall is light and evaporation from the surface is rapid in summer. Fortunately, the great rivers of the plains do not depend on prairie run-off for their main water supply.

Most of the water that flows east along the Saskatchewan through the drier parts of the Prairies comes from glacier-fed tributary streams such as the Bow, the Belly, and the St. Mary. From such headwaters the Saskatchewan flows 1300 miles to empty, through Cedar Lake, into Lake Winnipeg.

Two other important river systems flow towards the Nelson by way of Lake Winnipeg: the Red-Assiniboine from the south and west; and the English-Winnipeg, draining Lake of the Woods and northwestern Ontario. Altogether, the Saskatchewan-Nelson River system drains an area greater even than that drained by the St. Lawrence. The Nelson has a number of great natural reservoirs. These include Lake Winnipeg and Lakes Winnipegosis and Manitoba, large but shallow lakes that lie west of and almost parallel to Lake Winnipeg.

From Lake Methy, the Churchill River flows 1,000 miles across northern Saskatchewan and Manitoba, emptying into Hudson Bay at Churchill. Long used as a fur-traders' route to the interior, the river is important today as a future power source.

The Mackenzie, called the "River of Disappointment" by its discoverer because it flowed north to the Arctic, is the greatest river system of the western plains and the longest river in Canada. Its chief tributaries are the Peace and the Athabasca.

Two rivers, the Finlay and the Parsnip, meet in the long, narrow valley west of the Rockies and unite at Finlay Forks to form the Peace River. This mighty stream with enormous future power resources, cuts through the Rockies by way of a low water-gap and flows through Alberta to join the Slave River just north of Lake Athabasca.

A second famous river, the Athabasca, flows out from the Columbia ice field, through Jasper Park, and then across the Alberta plains to empty through a marshy delta into Lake Athabasca.



Questions: The River Systems of the Prairie Provinces

Choose the correct answer and blacken in the proper space on the answer sheet.

11. What is the approximate length of the Churchill River?
  - A. 100 miles
  - B. 500 miles
  - C. 1000 miles
  - D. 1300 miles
12. The only province the Athabasca River flows through is
  - A. Alberta
  - B. Saskatchewan
  - C. Manitoba
  - D. Ontario
13. A large lake that lies just west of Lake Winnipeg is
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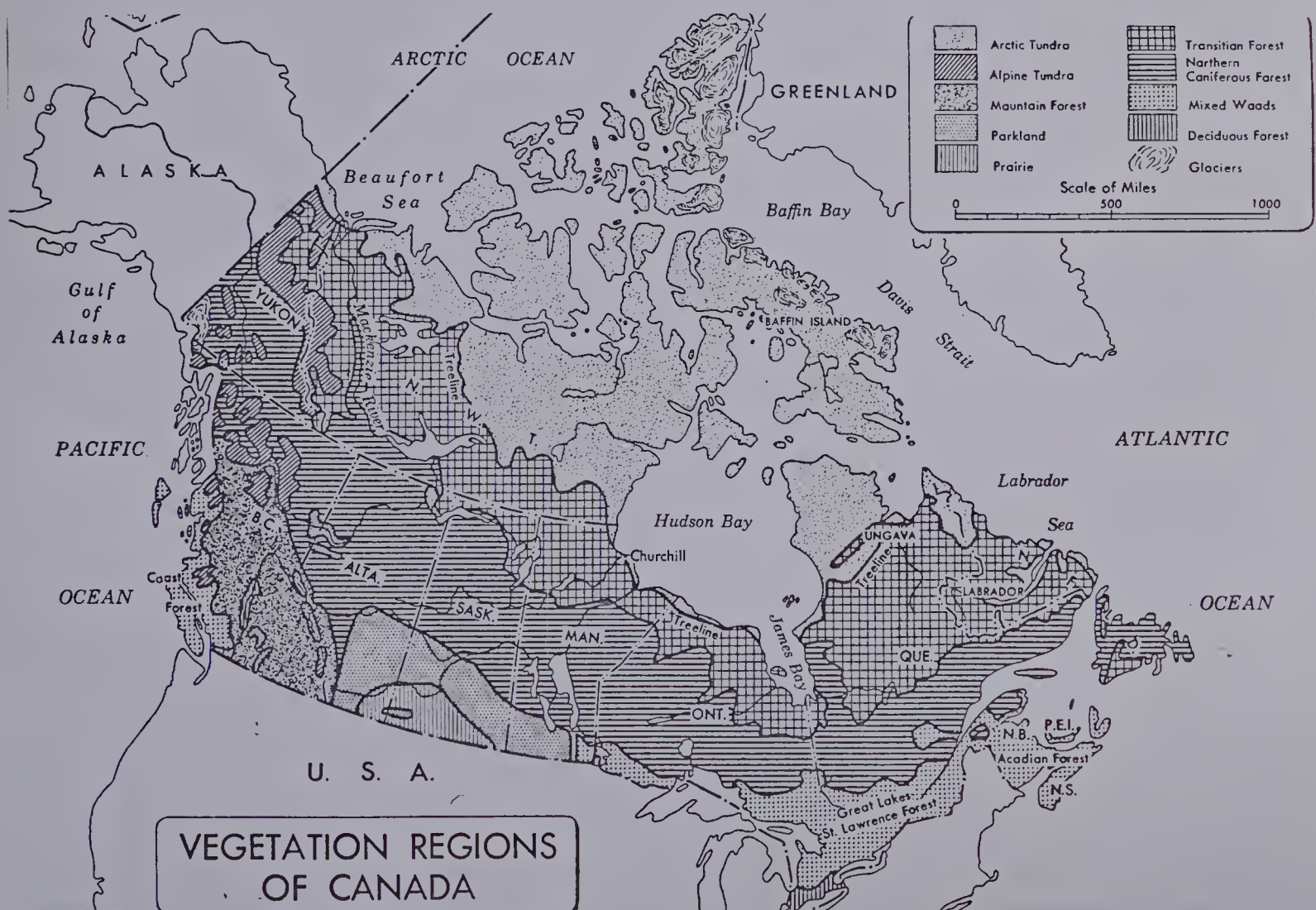
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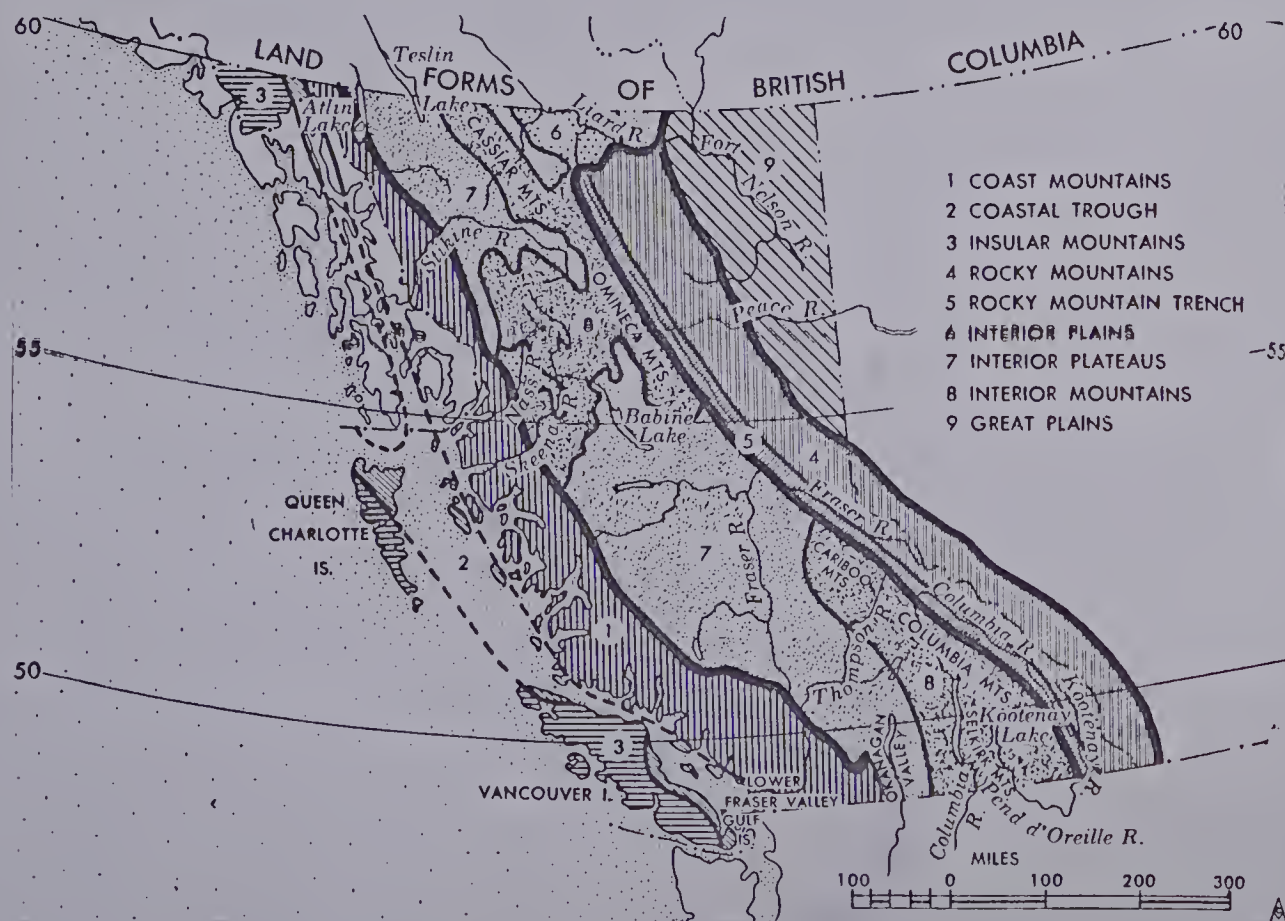
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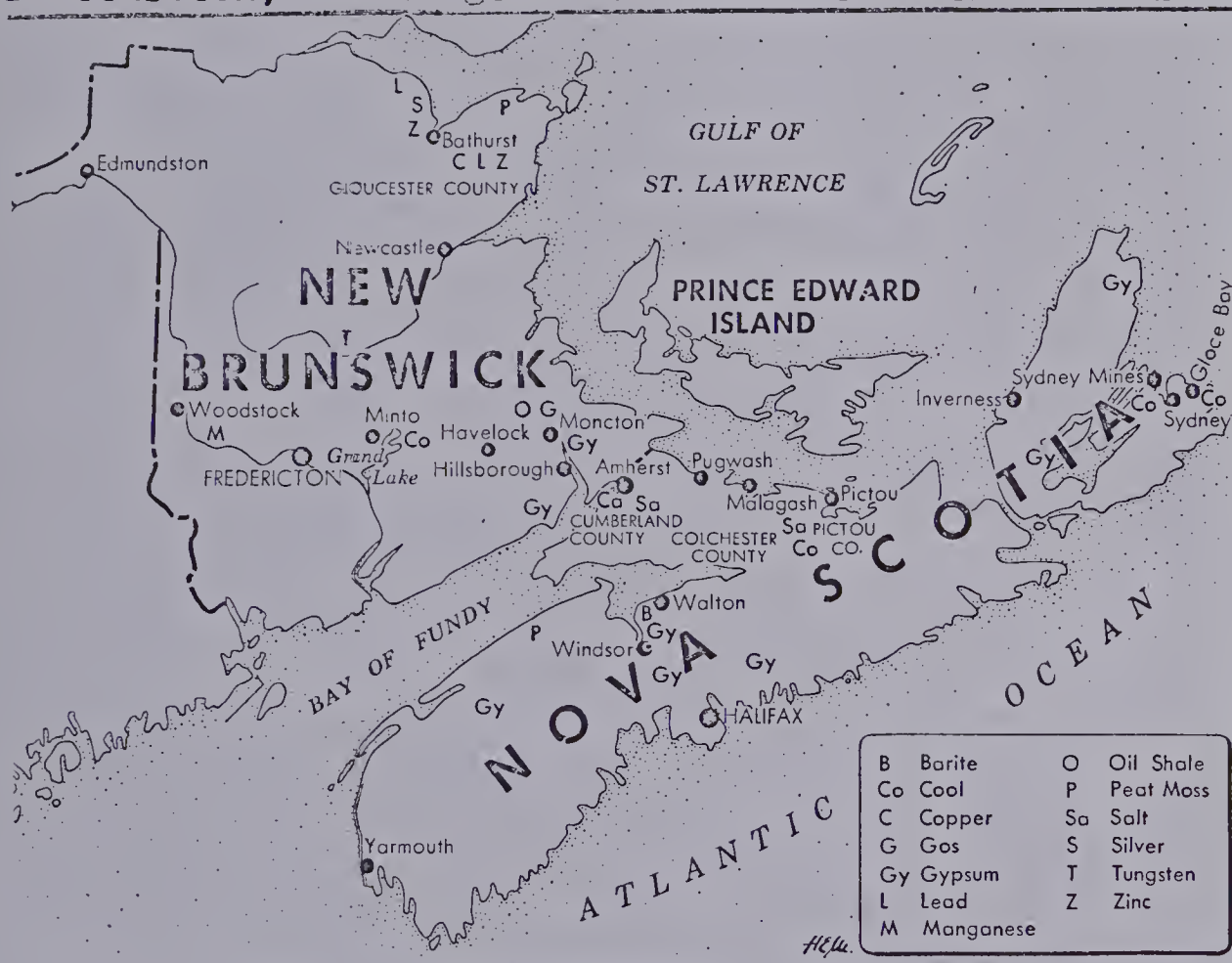


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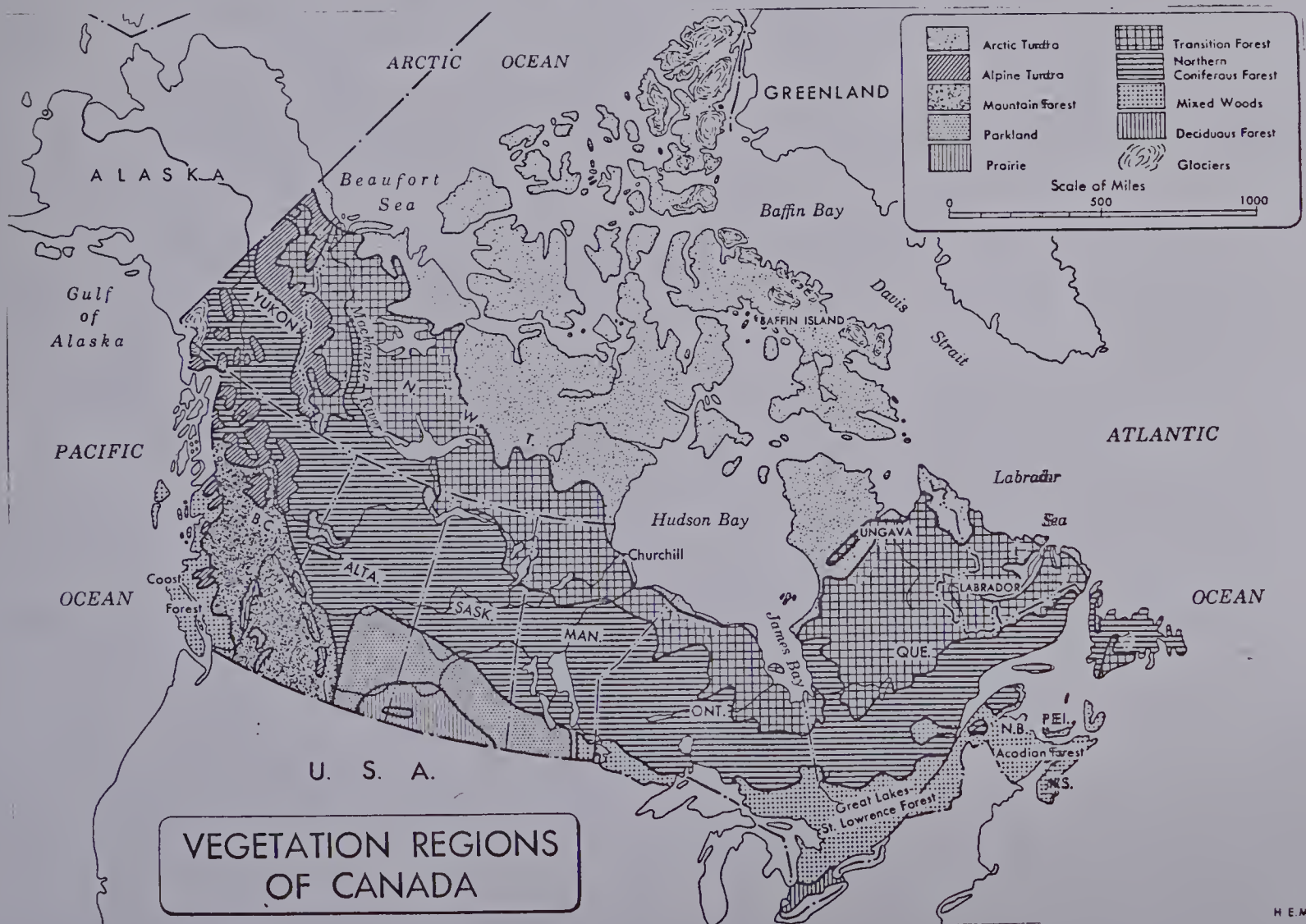
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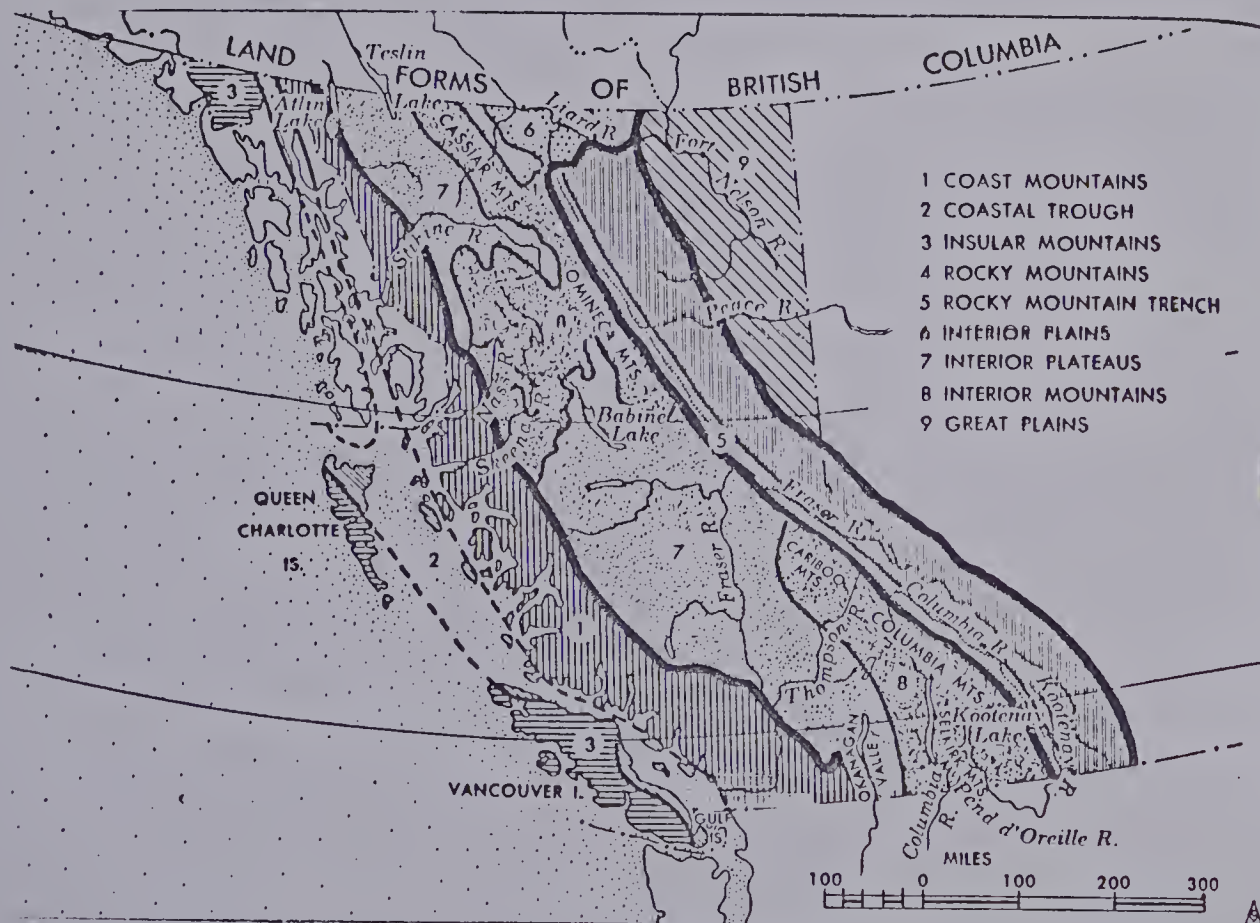
## SURFACE FEATURES OF BRITISH COLUMBIA

Except for a small area east of the Rocky Mountains, British Columbia is a huge sea of mountains and plateaus. The Cordillera, a mountainous region that stretches from the southern tip of South America to Alaska, occupies most of the province. Two great mountain systems, the Rocky Mountains on the east and the Coast Mountains on the west, extend throughout its entire length. Between them lie the Interior Uplands.

The Rocky Mountains, in Canada, extend from the United States border (49th parallel) to the valley of the Liard River and form part of the British Columbia-Alberta boundary. These high, sharp-peaked mountains form a succession of ridges and peaks, many of which are covered with snow the year round.

A deep valley from two to ten miles wide called the Rocky Mountain Trench lies just west of the Rockies. The floor of the trench is quite rough, and in some places there are marshes. The headwaters of the Columbia, the Fraser, and the Peace Rivers rise in this valley.

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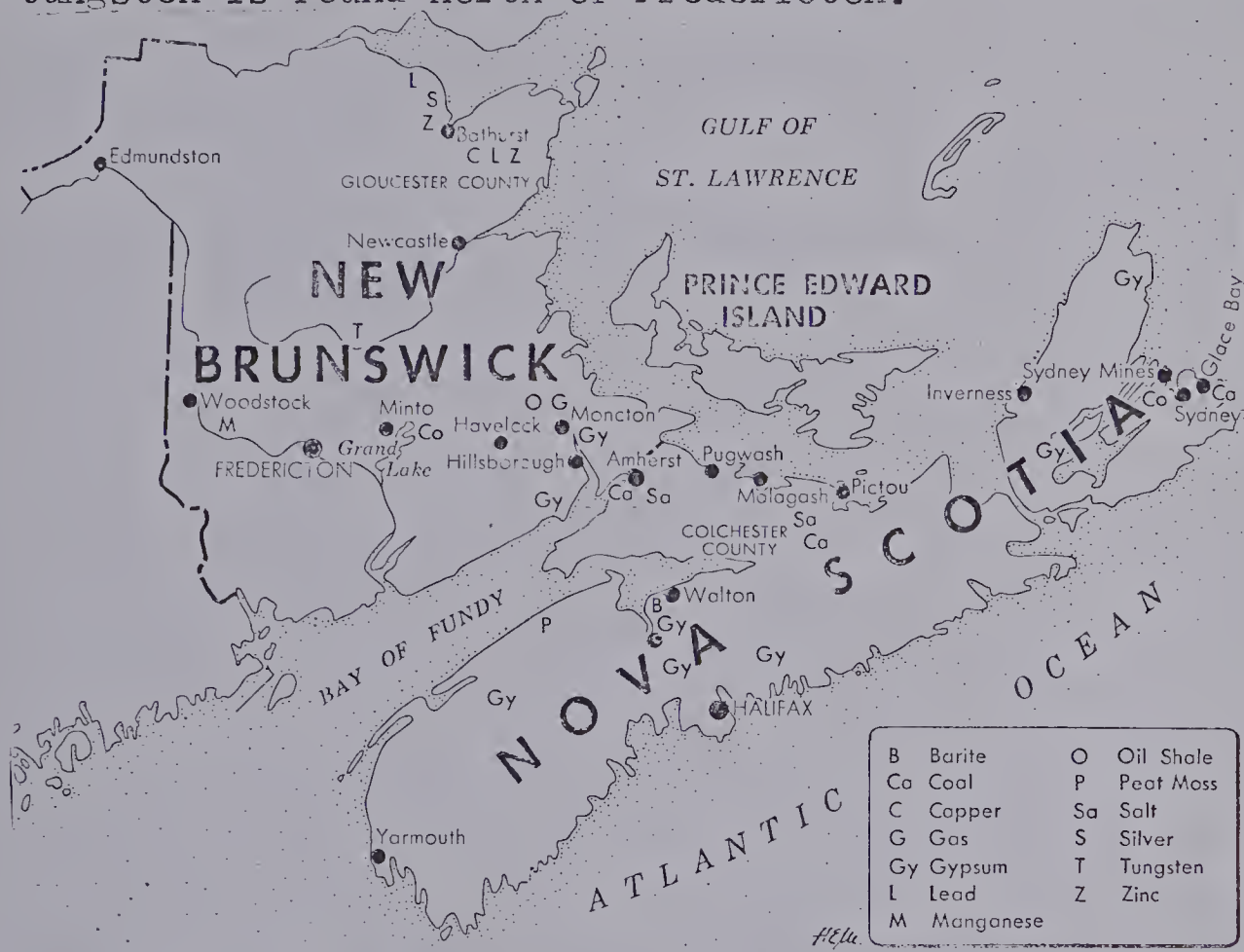


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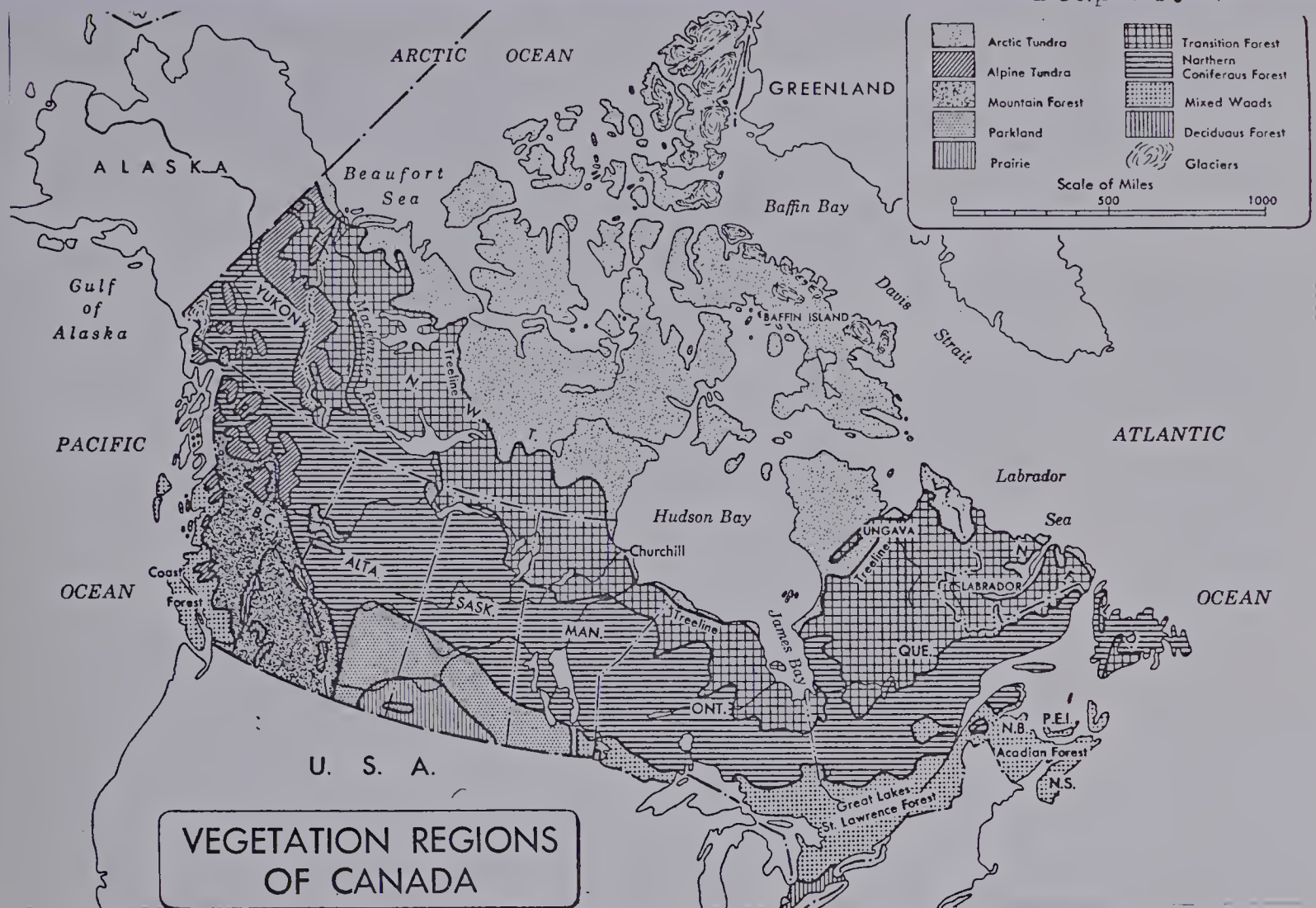


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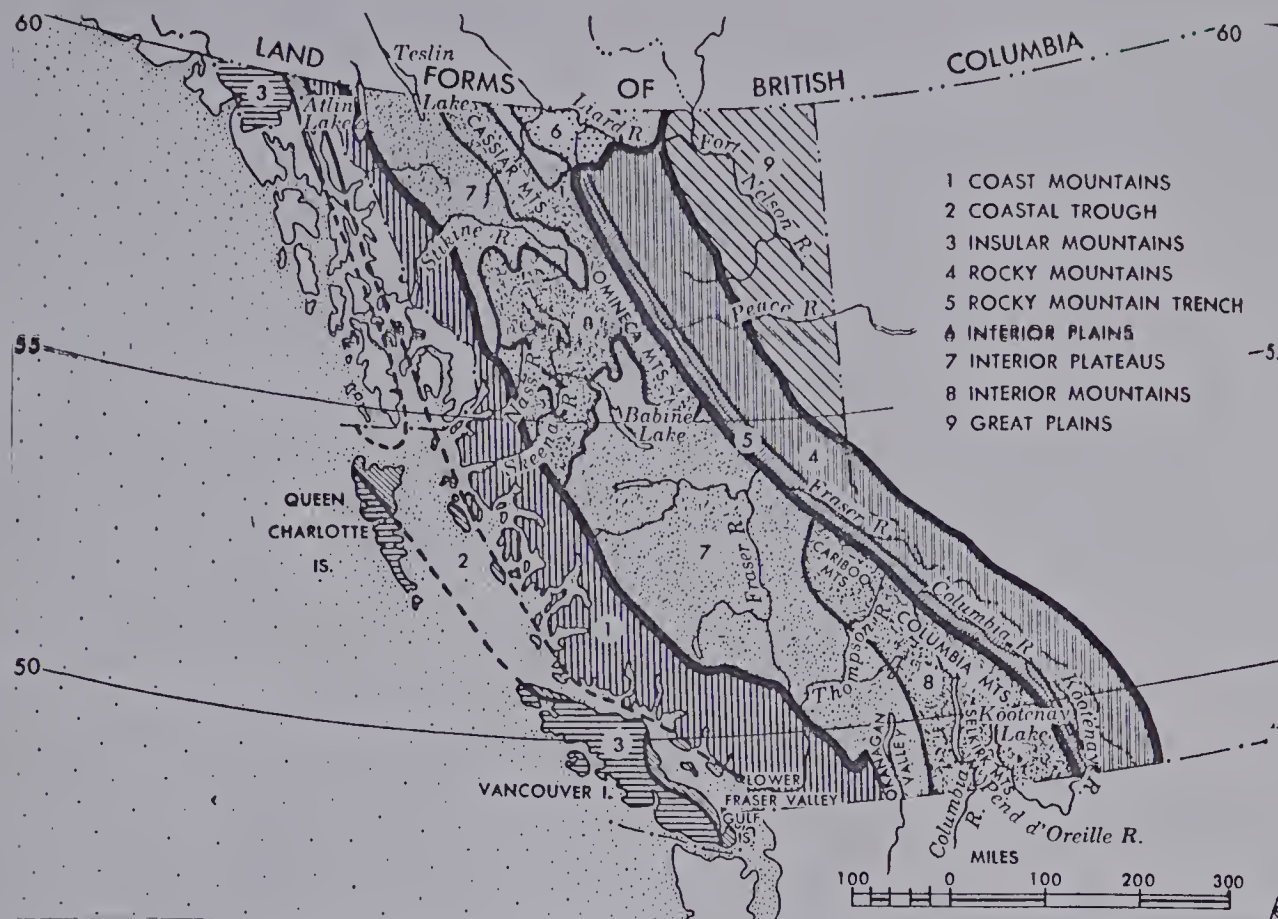




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- The distance between the mouth of the Mackenzie River and Churchill, Manitoba is about
  - 1000 miles
  - 1400 miles
  - 1750 miles
  - 2000 miles
- What type of forest covers most of the central part of Canada?
  - Mountain Forest
  - Transition Forest
  - Northern Coniferous Forest
  - Mixed Forest





Questions: Choose the correct answer and blacken in the proper space on the answer sheet.

6. What parallel of latitude forms the southern boundary of British Columbia?
  - A. 60th
  - B. 50th
  - C. 49th
  - D. 55th
7. Which of these rivers does not flow through the Coast Mountains?
  - A. Skeena
  - B. Fraser
  - C. Stikine
  - D. Fort Nelson
8. The average width of the Rocky Mountains is about
  - A. 5 miles
  - B. 50 miles
  - C. 500 miles
  - D. 5000 miles
9. What is the name of the river valley in the southwestern corner of British Columbia?
  - A. Kootenay River Valley
  - B. Skeena River Valley
  - C. Peace River Valley
  - D. Lower Fraser Valley
10. Which of the rivers that rise in the Rocky Mountains flows in an eastward direction from its source?
  - A. Columbia
  - B. Fraser
  - C. Skeena
  - D. Peace







Questions: Choose the correct answer and blacken in the proper space on the answer sheet.

11. What is the approximate length of the Churchill River?
  - A. 100 miles
  - B. 500 miles
  - C. 1000 miles
  - D. 1300 miles
12. The only province the Athabasca River flows through is
  - A. Alberta
  - B. Saskatchewan
  - C. Manitoba
  - D. Ontario
13. A large lake that lies just west of Lake Winnipeg is
  - A. Lake Manitoba
  - B. Lake Athabasca
  - C. Lake of the Woods
  - D. Cedar Lake
14. Which of the following lakes is not a natural reservoir for the Nelson River?
  - A. Lake Winnipeg
  - B. Lake Athabasca
  - C. Lake Manitoba
  - D. Lake Winnipegosis
15. In what general direction does the Saskatchewan River system flow?
  - A. north
  - B. south
  - C. east
  - D. west



## PARTIAL BATTERY



**DIRECTIONS:** Read the beginning part of each sentence and the words under it. Decide which of the answers given is *best*. Look at the answer spaces at the right or on your answer sheet (if you have one). Fill in the space which has the same number as the word you have chosen.

**SAMPLES**

**A** The name of a color is —

- |        |       |   |                       |                       |                                  |
|--------|-------|---|-----------------------|-----------------------|----------------------------------|
| 1 farm | 3 red | 1 | 2                     | 3                     | 4                                |
| 2 milk | 4 pet | A | <input type="radio"/> | <input type="radio"/> | <input checked="" type="radio"/> |

**B** The day that comes after Monday is —

- |           |             |   |                       |                       |                       |
|-----------|-------------|---|-----------------------|-----------------------|-----------------------|
| 5 Sunday  | 7 Wednesday | 5 | 6                     | 7                     | 8                     |
| 6 Tuesday | 8 Saturday  | B | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**1** To clutch a person's hand is to —

- |              |             |   |                       |                       |                       |
|--------------|-------------|---|-----------------------|-----------------------|-----------------------|
| 1 release it | 3 tickle it | 1 | 2                     | 3                     | 4                     |
| 2 grasp it   | 4 burn it   | 1 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**2** If your jacket is crumpled, it is —

- |           |            |   |                       |                       |                       |
|-----------|------------|---|-----------------------|-----------------------|-----------------------|
| 5 smooth  | 7 wrinkled | 5 | 6                     | 7                     | 8                     |
| 6 raveled | 8 torn     | 2 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**3** Something which you can see is —

- |             |           |   |                       |                       |                       |
|-------------|-----------|---|-----------------------|-----------------------|-----------------------|
| 1 invisible | 3 edible  | 1 | 2                     | 3                     | 4                     |
| 2 hidden    | 4 visible | 3 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**4** When you reduce something, you —

- |             |                   |   |                       |                       |                       |
|-------------|-------------------|---|-----------------------|-----------------------|-----------------------|
| 5 forget it | 7 make it smaller | 5 | 6                     | 7                     | 8                     |
| 6 remove it | 8 throw it away   | 4 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**5** A stream which contributes water to another stream is called a —

- |             |         |   |                       |                       |                       |
|-------------|---------|---|-----------------------|-----------------------|-----------------------|
| 1 pond      | 3 beach | 1 | 2                     | 3                     | 4                     |
| 2 tributary | 4 sea   | 5 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**6** A long, slippery fish shaped like a snake is called —

- |                |            |   |                       |                       |                       |
|----------------|------------|---|-----------------------|-----------------------|-----------------------|
| 5 a copperhead | 7 a lizard | 5 | 6                     | 7                     | 8                     |
| 6 a chameleon  | 8 an eel   | 6 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**7** A person guilty of a crime is a —

- |          |           |   |                       |                       |                       |
|----------|-----------|---|-----------------------|-----------------------|-----------------------|
| 1 judge  | 3 culprit | 1 | 2                     | 3                     | 4                     |
| 2 leader | 4 witness | 7 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**8** A long, narrow, mountain gorge with steep sides is called a —

- |           |         |   |                       |                       |                       |
|-----------|---------|---|-----------------------|-----------------------|-----------------------|
| 5 plateau | 7 plain | 5 | 6                     | 7                     | 8                     |
| 6 canyon  | 8 rut   | 8 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**9** Flint is a kind of —

- |        |          |   |                       |                       |                       |
|--------|----------|---|-----------------------|-----------------------|-----------------------|
| 1 rock | 3 cloth  | 1 | 2                     | 3                     | 4                     |
| 2 wood | 4 animal | 9 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**10** An incredible story is —

- |           |                |    |                       |                       |                       |
|-----------|----------------|----|-----------------------|-----------------------|-----------------------|
| 5 long    | 7 true         | 5  | 6                     | 7                     | 8                     |
| 6 endless | 8 unbelievable | 10 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**11** The giving up of something which is wanted or needed is —

- |               |                 |    |                       |                       |                       |
|---------------|-----------------|----|-----------------------|-----------------------|-----------------------|
| 1 a sacrifice | 3 a benefit     | 1  | 2                     | 3                     | 4                     |
| 2 a relief    | 4 an assistance | 11 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**12** A business transaction in which one gains by selling is said to be —

- |             |              |    |                       |                       |                       |
|-------------|--------------|----|-----------------------|-----------------------|-----------------------|
| 5 miserable | 7 bankruptcy | 5  | 6                     | 7                     | 8                     |
| 6 penurious | 8 profitable | 12 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**13** A group of people gathered for religious worship is called a —

- |              |                |    |                       |                       |                       |
|--------------|----------------|----|-----------------------|-----------------------|-----------------------|
| 1 colony     | 3 congregation | 1  | 2                     | 3                     | 4                     |
| 2 convention | 4 committee    | 13 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**14** To seek is to —

- |        |          |    |                       |                       |                       |
|--------|----------|----|-----------------------|-----------------------|-----------------------|
| 5 find | 7 settle | 5  | 6                     | 7                     | 8                     |
| 6 see  | 8 search | 14 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**15** A line passing through the center of a circle and with its ends on the circle is called a —

- |           |            |    |                       |                       |                       |
|-----------|------------|----|-----------------------|-----------------------|-----------------------|
| 1 radius  | 3 diameter | 1  | 2                     | 3                     | 4                     |
| 2 diamond | 4 diagonal | 15 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**16** If you are daring but unwise, you are considered to be —

- |             |            |    |                       |                       |                       |
|-------------|------------|----|-----------------------|-----------------------|-----------------------|
| 5 foolhardy | 7 shameful | 5  | 6                     | 7                     | 8                     |
| 6 awkward   | 8 noisy    | 16 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**17** That which is extremely cold is —

- |             |          |    |                       |                       |                       |
|-------------|----------|----|-----------------------|-----------------------|-----------------------|
| 1 cool      | 3 frigid | 1  | 2                     | 3                     | 4                     |
| 2 temperate | 4 torrid | 17 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**18** To be humiliated is to be —

- |          |             |    |                       |                       |                       |
|----------|-------------|----|-----------------------|-----------------------|-----------------------|
| 5 hated  | 7 lost      | 5  | 6                     | 7                     | 8                     |
| 6 hungry | 8 mortified | 18 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**19** An audience held spellbound is —

- |              |               |    |                       |                       |                       |
|--------------|---------------|----|-----------------------|-----------------------|-----------------------|
| 1 fascinated | 3 reassured   | 1  | 2                     | 3                     | 4                     |
| 2 convinced  | 4 indifferent | 19 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**20** An official count of people is called a —

- |            |              |    |                       |                       |                       |
|------------|--------------|----|-----------------------|-----------------------|-----------------------|
| 5 grouping | 7 census     | 5  | 6                     | 7                     | 8                     |
| 6 document | 8 conference | 20 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**21** If you can see through something, it is —

- |               |               |    |                       |                       |                       |
|---------------|---------------|----|-----------------------|-----------------------|-----------------------|
| 1 translucent | 3 solid       | 1  | 2                     | 3                     | 4                     |
| 2 opaque      | 4 transparent | 21 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

**22** The maintenance and preservation of our natural resources is called —

- |                |                 |    |                       |                       |                       |
|----------------|-----------------|----|-----------------------|-----------------------|-----------------------|
| 5 conservation | 7 reservation   | 5  | 6                     | 7                     | 8                     |
| 6 elimination  | 8 concentration | 22 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

23 A wandering singer and storyteller is —

- |                |              |    |                       |                       |                       |
|----------------|--------------|----|-----------------------|-----------------------|-----------------------|
| 1 a writer     | 3 a minstrel | 1  | 2                     | 3                     | 4                     |
| 2 a lumberjack | 4 an acrobat | 23 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

24 A timid person is —

- |           |          |    |                       |                       |                       |
|-----------|----------|----|-----------------------|-----------------------|-----------------------|
| 5 lonely  | 7 hungry | 5  | 6                     | 7                     | 8                     |
| 6 fearful | 8 tired  | 24 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

25 When you inscribe something, you —

- |                 |              |    |                       |                       |                       |
|-----------------|--------------|----|-----------------------|-----------------------|-----------------------|
| 1 write on it   | 3 find it    | 1  | 2                     | 3                     | 4                     |
| 2 search for it | 4 inspect it | 25 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

26 To discontinue for a time is to —

- |           |            |    |                       |                       |                       |
|-----------|------------|----|-----------------------|-----------------------|-----------------------|
| 5 resume  | 7 progress | 5  | 6                     | 7                     | 8                     |
| 6 suspend | 8 disturb  | 26 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

27 Strain on a wire caused by action of a pulling force is called —

- |             |           |    |                       |                       |                       |
|-------------|-----------|----|-----------------------|-----------------------|-----------------------|
| 1 remission | 3 slack   | 1  | 2                     | 3                     | 4                     |
| 2 weakness  | 4 tension | 27 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

28 An anonymous author is —

- |           |              |    |                       |                       |                       |
|-----------|--------------|----|-----------------------|-----------------------|-----------------------|
| 5 old     | 7 poor       | 5  | 6                     | 7                     | 8                     |
| 6 unknown | 8 well-known | 28 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

29 If you liberate a pet rabbit, you —

- |           |           |    |                       |                       |                       |
|-----------|-----------|----|-----------------------|-----------------------|-----------------------|
| 1 free it | 3 love it | 1  | 2                     | 3                     | 4                     |
| 2 kill it | 4 feed it | 29 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

30 A concise reply to a question is —

- |             |               |    |                       |                       |                       |
|-------------|---------------|----|-----------------------|-----------------------|-----------------------|
| 5 incorrect | 7 lengthy     | 5  | 6                     | 7                     | 8                     |
| 6 brief     | 8 complicated | 30 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

31 A chronic worrier is a person who worries —

- |                |                  |    |                       |                       |                       |
|----------------|------------------|----|-----------------------|-----------------------|-----------------------|
| 1 continuously | 3 frequently     | 1  | 2                     | 3                     | 4                     |
| 2 seldom       | 4 intermittently | 31 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

32 When you are a spectator, you —

- |            |           |    |                       |                       |                       |
|------------|-----------|----|-----------------------|-----------------------|-----------------------|
| 5 practice | 7 watch   | 5  | 6                     | 7                     | 8                     |
| 6 sail     | 8 inspect | 32 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

33 To wither is to —

- |        |          |    |                       |                       |                       |
|--------|----------|----|-----------------------|-----------------------|-----------------------|
| 1 run  | 3 wander | 1  | 2                     | 3                     | 4                     |
| 2 wish | 4 dry    | 33 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

34 A person who speaks with a slow, lengthened tone —

- |            |            |    |                       |                       |                       |
|------------|------------|----|-----------------------|-----------------------|-----------------------|
| 5 stutters | 7 chatters | 5  | 6                     | 7                     | 8                     |
| 6 drawls   | 8 shrieks  | 34 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

35 Beds on a train are sometimes called —

- |            |          |    |                       |                       |                       |
|------------|----------|----|-----------------------|-----------------------|-----------------------|
| 1 sleepers | 3 berths | 1  | 2                     | 3                     | 4                     |
| 2 gliders  | 4 cots   | 35 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

36 A person who is perplexed is —

- |               |              |    |                       |                       |                       |
|---------------|--------------|----|-----------------------|-----------------------|-----------------------|
| 5 confused    | 7 lazy       | 5  | 6                     | 7                     | 8                     |
| 6 misinformed | 8 friendless | 36 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

37 The destruction of an entire race of people would make that race —

- |               |             |    |                       |                       |                       |
|---------------|-------------|----|-----------------------|-----------------------|-----------------------|
| 1 extinct     | 3 bountiful | 1  | 2                     | 3                     | 4                     |
| 2 rejuvenated | 4 abundant  | 37 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

38 The locality in which an animal usually lives is called its —

- |           |            |    |                       |                       |                       |
|-----------|------------|----|-----------------------|-----------------------|-----------------------|
| 5 habitat | 7 hacienda | 5  | 6                     | 7                     | 8                     |
| 6 habit   | 8 cage     | 38 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

39 When you descend a mountain, you —

- |             |              |    |                       |                       |                       |
|-------------|--------------|----|-----------------------|-----------------------|-----------------------|
| 1 climb up  | 3 explore it | 1  | 2                     | 3                     | 4                     |
| 2 come down | 4 avoid it   | 39 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

40 An impromptu speech is —

- |                |             |    |                       |                       |                       |
|----------------|-------------|----|-----------------------|-----------------------|-----------------------|
| 5 premeditated | 7 practiced | 5  | 6                     | 7                     | 8                     |
| 6 prepared     | 8 unplanned | 40 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

41 A deceitful person is —

- |              |               |    |                       |                       |                       |
|--------------|---------------|----|-----------------------|-----------------------|-----------------------|
| 1 upright    | 3 fraudulent  | 1  | 2                     | 3                     | 4                     |
| 2 dependable | 4 trustworthy | 41 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

42 A look of derision is —

- |            |              |    |                       |                       |                       |
|------------|--------------|----|-----------------------|-----------------------|-----------------------|
| 5 admiring | 7 respectful | 5  | 6                     | 7                     | 8                     |
| 6 scornful | 8 reverent   | 42 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

43 A candid answer to a question is —

- |          |               |    |                       |                       |                       |
|----------|---------------|----|-----------------------|-----------------------|-----------------------|
| 1 untrue | 3 short       | 1  | 2                     | 3                     | 4                     |
| 2 frank  | 4 complicated | 43 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

44 When people disperse, they —

- |              |           |    |                       |                       |                       |
|--------------|-----------|----|-----------------------|-----------------------|-----------------------|
| 5 accumulate | 7 scatter | 5  | 6                     | 7                     | 8                     |
| 6 congregate | 8 die     | 44 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

45 People conquered by their enemy are —

- |             |              |    |                       |                       |                       |
|-------------|--------------|----|-----------------------|-----------------------|-----------------------|
| 1 liberated | 3 destroyed  | 1  | 2                     | 3                     | 4                     |
| 2 educated  | 4 subjugated | 45 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

46 When your duties are neglected, they are —

- |             |            |    |                       |                       |                       |
|-------------|------------|----|-----------------------|-----------------------|-----------------------|
| 5 increased | 7 slighted | 5  | 6                     | 7                     | 8                     |
| 6 boring    | 8 removed  | 46 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

47 A bitter and irritated person is —

- |              |            |    |                       |                       |                       |
|--------------|------------|----|-----------------------|-----------------------|-----------------------|
| 1 galled     | 3 pacified | 1  | 2                     | 3                     | 4                     |
| 2 reconciled | 4 appeased | 47 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

48 A hard coal that burns with very little smoke or flame is called —

- |            |              |    |                       |                       |                       |
|------------|--------------|----|-----------------------|-----------------------|-----------------------|
| 5 coke     | 7 bituminous | 5  | 6                     | 7                     | 8                     |
| 6 charcoal | 8 anthracite | 48 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

STOP



## TEST 2: Paragraph Meaning

**DIRECTIONS:** Read each paragraph below. Decide which of the numbered words or phrases below the paragraph is *best* for each blank. Look at the answer spaces at the right or on your answer sheet (if you have one). Fill in the space which has the same number as the word(s) you have chosen.

### SAMPLES

We went up in an airplane. At first we flew near the A where we could see people and animals. Later we could not see them. Our plane was too B.

- |           |         |                                                                                                      |
|-----------|---------|------------------------------------------------------------------------------------------------------|
| A 1 house | 3 town  | 1 2 3 4                                                                                              |
| 2 ground  | 4 hills | A <input type="radio"/> <input checked="" type="radio"/> <input type="radio"/> <input type="radio"/> |
| B 5 high  | 7 far   | 5 6 7 8                                                                                              |
| 6 low     | 8 fast  | B <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>            |

Bread used to be quite expensive, but rolls were even 1.

- |                    |                  |                                                                                           |
|--------------------|------------------|-------------------------------------------------------------------------------------------|
| 1 1 less expensive | 3 the same price | 1 2 3 4                                                                                   |
| 2 more expensive   | 4 as expensive   | 1 <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> |

Although the girls were not related, their resemblance was striking. Even their voices sounded 2.

- |             |         |                                                                                           |
|-------------|---------|-------------------------------------------------------------------------------------------|
| 2 5 alike   | 7 high  | 5 6 7 8                                                                                   |
| 6 different | 8 sharp | 2 <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> |

If you look at your hands closely, you will see that the skin has little ridges. The pattern of the ridges on the tip of one of your fingers never changes while you live, and this 3 is different from that on any other finger in the world. This is why the police can use 4 as a means of identification.

- |                 |                |                                                                                           |
|-----------------|----------------|-------------------------------------------------------------------------------------------|
| 3 1 color       | 3 texture      | 1 2 3 4                                                                                   |
| 2 design        | 4 feeling      | 3 <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> |
| 4 5 photographs | 7 handshakes   | 5 6 7 8                                                                                   |
| 6 handwriting   | 8 fingerprints | 4 <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> |

The Olympic Games, named after Olympia, the town in Greece where they were first held, were started to entertain the dwellers on Olympus. These most important of all the ancient 5 were held every four years and lasted five days. An enclosed plain was dedicated to them, and they were eagerly attended not only by the 6, but also by men from other lands far and near.

- |                 |              |                                                                                           |
|-----------------|--------------|-------------------------------------------------------------------------------------------|
| 5 1 wars        | 3 towns      | 1 2 3 4                                                                                   |
| 2 games         | 4 sacrifices | 5 <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> |
| 6 5 contestants | 7 Greeks     | 5 6 7 8                                                                                   |
| 6 spectators    | 8 Romans     | 6 <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> |

A fresh egg is heavier than water. It will 7 when placed in water. In a rotten egg, the yolk and the white have split up into other things and by chemical reaction have produced gases. The 8 will cause the rotten egg to float in water.

- |           |         |                                                                                           |
|-----------|---------|-------------------------------------------------------------------------------------------|
| 7 1 break | 3 float | 1 2 3 4                                                                                   |
| 2 shrink  | 4 sink  | 7 <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> |
| 8 5 gases | 7 yolk  | 5 6 7 8                                                                                   |
| 6 shell   | 8 heat  | 8 <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> |

If there is a steady wind which usually blows from one direction, that wind may bend a tree; or if a tree grows in a place, such as near a wall, where the light strikes its sides unequally, it may grow crooked. But a tree usually grows 9 because that is the best way for it to grow, and because everything generally helps it to do so. Also, a tree throws out branches about equally on all sides so that their weight all around helps to 10 it and keep it straight.

- |               |            |                                                                                            |
|---------------|------------|--------------------------------------------------------------------------------------------|
| 9 1 fast      | 3 straight | 1 2 3 4                                                                                    |
| 2 at an angle | 4 full     | 9 <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>  |
| 10 5 tilt     | 7 retard   | 5 6 7 8                                                                                    |
| 6 loosen      | 8 balance  | 10 <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> |

Archeologists can tell the age of the various old bones and ashes they find in ruins. Anything which is alive absorbs carbon 14 from the atmosphere. When a living thing dies, the carbon 14 begins to decay and vanish. By measuring the amount of 11 remaining in a bone, a piece of wood, or anything else which 12, we can tell how 13 it is.

- |                  |                               |                                                                                            |
|------------------|-------------------------------|--------------------------------------------------------------------------------------------|
| 11 1 archeology  | 3 bone                        | 1 2 3 4                                                                                    |
| 2 carbon 14      | 4 flesh                       | 11 <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> |
| 12 5 we dig up   | 6 belongs to the archeologist | 5 6 7 8                                                                                    |
| 7 was once alive | 8 we might find               | 12 <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> |
| 13 1 old         | 3 long                        | 1 2 3 4                                                                                    |
| 2 heavy          | 4 good                        | 13 <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> |

Planetary means wandering or moving about. When ancient astronomers watched the skies, they noticed that most stars remained in the same relative positions night after night. A few very bright stars, however, moved about in position from night to night. The 14 called these bodies planets because they 15.

- |                              |                      |                                                                                            |
|------------------------------|----------------------|--------------------------------------------------------------------------------------------|
| 14 5 astronomers             | 7 planets            | 5 6 7 8                                                                                    |
| 6 bright stars               | 8 wanderers          | 14 <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> |
| 15 1 wandered or moved about | 2 were few in number | 1 2 3 4                                                                                    |
| 3 were very bright           | 4 were very ancient  | 15 <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> |

When Jane went shopping for a dress, she bought the least expensive one 16 her limited budget.

- 16 5 in spite of 7 regardless of 5 6 7 8  
6 notwithstanding 8 on account of 16 ☐ ☐ ☐ ☐

The edges of the leaves of books used to be gilt not only for appearance, but also to present a smooth surface which would not readily collect 17.

- 17 1 readers 3 dust 1 2 3 4  
2 print 4 borrowers 17 ☐ ☐ ☐ ☐

John and Ned are entirely different in body build. John is tall and rather stocky, while Ned is 18 and quite 19.

- 18 5 big 7 fat 5 6 7 8  
6 short 8 tall 18 ☐ ☐ ☐ ☐

- 19 1 husky 3 broad 1 2 3 4  
2 strong 4 thin 19 ☐ ☐ ☐ ☐

Most active life on earth cannot exist at temperatures below the freezing point or 20 the boiling point of water. Some cold-blooded animals, however, may be frozen and yet live if they are very slowly thawed out. Bacteria and fungi have survived the freezing effects of a fourteen-mile-high balloon trip. At the other extreme, some bacterial spores have been 21 in water for hours without dying. However, warm-blooded animals cannot withstand such extremes in 22.

- 20 5 below 7 above 5 6 7 8  
6 under 8 through 20 ☐ ☐ ☐ ☐

- 21 1 frozen 3 suspended 1 2 3 4  
2 boiled 4 left 21 ☐ ☐ ☐ ☐

- 22 5 distance 7 time 5 6 7 8  
6 water 8 temperature 22 ☐ ☐ ☐ ☐

Hippocrates, often called the father of medicine, lived during the golden age of Greece. His main contribution to the medical profession, as we know it today, was his attempt to separate medicine from magic and superstition. Many of his standards and beliefs about 23 are contained in the "Hippocratic Oath," which is still required of students upon graduation from 24 schools.

- 23 1 medicine 3 magic 1 2 3 4  
2 health 4 superstition 23 ☐ ☐ ☐ ☐

- 24 5 high 7 medical 5 6 7 8  
6 magician 8 religious 24 ☐ ☐ ☐ ☐

John is able to swim the length of the pool in 25 seconds. In order to determine how fast he can swim, one must know the 25.

- 25 1 depth of the pool at each end  
2 length of the pool  
3 type of stroke he uses 1 2 3 4  
4 area of the pool 25 ☐ ☐ ☐ ☐

The amount of stress or tension needed to snap a rope or cable is what determines its breaking point. The more 26 a rope can stand, the higher is its 27. Surprisingly enough, ten men pulling on a cable which is tied to a tree exert the same amount of 28 as is exerted on a rope which ten men are pulling from each end.

- 26 5 cable 7 stress 5 6 7 8  
6 breaking point 8 amount 26 ☐ ☐ ☐ ☐

- 27 1 stress 3 tension 1 2 3 4  
2 breaking point 4 cable 27 ☐ ☐ ☐ ☐

- 28 5 tension 7 cable 5 6 7 8  
6 breaking point 8 elasticity 28 ☐ ☐ ☐ ☐

Vibrations in the air which we hear as sound are called sound waves. The length of the wave makes the pitch of sound. The shorter the wave, the higher the 29. Waves shorter than one-fourth inch are not 30 to the human ear.

- 29 1 loudness 3 pitch 1 2 3 4  
2 wind 4 heat 29 ☐ ☐ ☐ ☐

- 30 5 audible 7 measurable 5 6 7 8  
6 visible 8 dangerous 30 ☐ ☐ ☐ ☐

Our sense of smell strongly influences our sense of taste. When we have a cold, it impedes first our sense of 31, which in turn affects our sense of 32. We have four basic tastes. We taste bitter flavors with the back of the tongue, sweet and salt at the tip and the edges. To enjoy candy the most, we should chew it 33.

- 31 1 touch 3 smell 1 2 3 4  
2 hearing 4 taste 31 ☐ ☐ ☐ ☐

- 32 5 taste 7 touch 5 6 7 8  
6 smell 8 reason 32 ☐ ☐ ☐ ☐

- 33 1 at the back of the mouth  
2 away from the tongue  
3 at the top of the mouth 1 2 3 4  
4 at the front of the mouth 33 ☐ ☐ ☐ ☐



## TEST 2: Paragraph Meaning (Continued)

A strange fact is that ice is lighter than liquid water, even though it is colder. The general rule is that things get heavier (per unit of volume) as they get colder, and lighter (again, per unit of 34) as they get hotter. This is because heat expands them and cold 35 them. But at the freezing point, water does not obey this rule; it begins to expand before it reaches its freezing point. This is why unprotected water pipes sometimes 36 in winter.

- 34 5 area 7 volume 5 6 7 8  
6 weight 8 surface 34 ☐ ☐ ☐ ☐

- 35 1 extends 3 spreads 1 2 3 4  
2 freezes 4 contracts 35 ☐ ☐ ☐ ☐

- 36 5 burst 7 rust 5 6 7 8  
6 shrink 8 stretch 36 ☐ ☐ ☐ ☐

Puerto Rico is a rough, mountainous island. A range of mountains, from 2000 to 3500 feet in height, runs the length of the island, east to west, dividing it so that the northern section is twice the size of the southern. The eastern and western ends of the mountain range plunge precipitously into the sea. There is little coastal plain along the north coast, but along the south coast this plain is several miles wide.

The best title for this paragraph would be 37.

- 37 1 Puerto Rico, Island Paradise  
2 A Caribbean Island  
3 Puerto Rico — Our Next State?  
4 The Geography of Puerto Rico 37 ☐ ☐ ☐ ☐

The information in the passage suggests that you could not cross Puerto Rico from north to south by boat because 38.

- 38 5 the rivers all run from east to west  
6 rivers do not flow across mountain ranges  
7 there are no rivers  
8 Puerto Ricans do not own boats 38 ☐ ☐ ☐ ☐

The long axis of Puerto Rico runs from 39.

- 39 1 north to south  
2 southwest to northeast  
3 east to west  
4 southeast to northwest 39 ☐ ☐ ☐ ☐

Rice, a crop which grows best in low, flat areas, would probably grow best on the 40 coast of Puerto Rico.

- 40 5 north 7 west 5 6 7 8  
6 east 8 south 40 ☐ ☐ ☐ ☐

From reading the paragraph, one could say that the writer was being 41.

- 41 1 imaginative 3 scientific 1 2 3 4  
2 allegorical 4 poetic 41 ☐ ☐ ☐ ☐

Does getting wet and chilly produce colds? English researchers studied three groups of people. Group one was inoculated with cold virus and kept warm and dry. Group two was inoculated with cold virus and kept wet and chilled. Group three was kept wet and cold but was not inoculated with 42. Equal numbers in groups one and two caught cold, but no one in group three caught a cold. The evidence from this experiment indicates that getting wet and cold 43.

- 42 5 cold water 7 warm virus 5 6 7 8  
6 cold virus 8 wet and cold 42 ☐ ☐ ☐ ☐

- 43 1 causes colds  
2 does not cause colds  
3 helps you to catch cold  
4 helps you stay healthy 43 ☐ ☐ ☐ ☐

Don Quixote thought that the windmills were giants, and he was determined to engage in a dreadful combat with them. He believed that the sails were moving arms. He covered himself with his shield and rushed with utmost speed upon the first windmill, running his lance into one of the sails. The wind whirled the sails about with such swiftness that their momentum broke the lance into pieces and hurled away both knight and horse.

Don Quixote was actually defeated in this combat by 44.

- 44 5 the wind 7 his lance 5 6 7 8  
6 his horse 8 a giant 44 ☐ ☐ ☐ ☐

"Knight" in the last sentence refers to 45.

- 45 1 Don Quixote  
2 a giant  
3 a windmill  
4 Don Quixote's companion 45 ☐ ☐ ☐ ☐

It is apparent that Don Quixote was 46.

- 46 5 inaccurate with a lance  
6 not very brave  
7 blind  
8 a bit confused 46 ☐ ☐ ☐ ☐

The word "running" in the third sentence means 47.

- 47 1 thrusting 3 following 1 2 3 4  
2 pulling 4 spinning 47 ☐ ☐ ☐ ☐

The "sails" referred to are most like the 48.

- 48 5 hands of a clock  
6 branches of a tree  
7 blades of a fan  
8 sails on a ship 48 ☐ ☐ ☐ ☐





# TEST 3: Spelling

**DIRECTIONS:** Read each of the groups of words below. One of the words in each group is misspelled. Find the word that has been misspelled. Look at the answer spaces at the right or on your answer sheet (if you have one). Fill in the space which has the same number as the word you have chosen.

## SAMPLES

**A** 1 dog 3 walk 1 2 3 4  
2 boy 4 yse **A** ☐ ☐ ☐ ☒

**B** 5 this 7 cold 5 6 7 8  
6 kap 8 tell **B** ☐ ☐ ☐ ☐

**1** 1 suddenly 3 fiting 1 2 3 4  
2 justly 4 rare **1** ☐ ☐ ☐ ☐

**2** 5 hospetal 7 pennies 5 6 7 8  
6 rifle 8 support **2** ☐ ☐ ☐ ☐

**3** 1 tried 3 gone 1 2 3 4  
2 noticed 4 allthough **3** ☐ ☐ ☐ ☐

**4** 5 vacation 7 kichen 5 6 7 8  
6 empty 8 watched **4** ☐ ☐ ☐ ☐

**5** 1 idel 3 signal 1 2 3 4  
2 courage 4 countries **5** ☐ ☐ ☐ ☐

**6** 5 raised 7 suger 5 6 7 8  
6 jumped 8 figure **6** ☐ ☐ ☐ ☐

**7** 1 heavey 3 invented 1 2 3 4  
2 sign 4 station **7** ☐ ☐ ☐ ☐

**8** 5 divided 7 ought 5 6 7 8  
6 moddern 8 perfume **8** ☐ ☐ ☐ ☐

**9** 1 sorrow 3 punish 1 2 3 4  
2 climet 4 mixture **9** ☐ ☐ ☐ ☐

**10** 5 healthy 7 automobile 5 6 7 8  
6 laid 8 stoped **10** ☐ ☐ ☐ ☐

**11** 1 division 3 consider 1 2 3 4  
2 impotence 4 length **11** ☐ ☐ ☐ ☐

**12** 5 suits 7 crowd 5 6 7 8  
6 ladys 8 struck **12** ☐ ☐ ☐ ☐

**13** 1 governed 3 stepped 1 2 3 4  
2 happily 4 satesfied **13** ☐ ☐ ☐ ☐

**14** 5 progam 7 none 5 6 7 8  
6 slide 8 sort **14** ☐ ☐ ☐ ☐

**15** 1 tools 3 slip 1 2 3 4  
2 press 4 boxs **15** ☐ ☐ ☐ ☐

**16** 5 leaf 7 during 5 6 7 8  
6 matches 8 cryed **16** ☐ ☐ ☐ ☐

**17** 1 industry 3 allowed 1 2 3 4  
2 gaurd 4 presents **17** ☐ ☐ ☐ ☐

**18** 5 style 7 developped 5 6 7 8  
6 favorite 8 exact **18** ☐ ☐ ☐ ☐

**19** 1 inocent 3 diameter 1 2 3 4  
2 naturally 4 completely **19** ☐ ☐ ☐ ☐

**20** 5 merchants 7 sword 5 6 7 8  
6 tardy 8 colection **20** ☐ ☐ ☐ ☐

**21** 1 flys 3 curtains 1 2 3 4  
2 dwell 4 fairly **21** ☐ ☐ ☐ ☐

**22** 5 afterwards 7 choosen 5 6 7 8  
6 tennis 8 joined **22** ☐ ☐ ☐ ☐

**23** 1 capable 3 fedral 1 2 3 4  
2 custom 4 construction **23** ☐ ☐ ☐ ☐

**24** 5 assistance 7 reference 5 6 7 8  
6 socity 8 educational **24** ☐ ☐ ☐ ☐

**25** 1 encurraging 3 veil 1 2 3 4  
2 distinction 4 convenient **25** ☐ ☐ ☐ ☐

**26** 5 alfalfa 7 conference 5 6 7 8  
6 appreciate 8 phisical **26** ☐ ☐ ☐ ☐

**27** 1 criminal 3 paragraph 1 2 3 4  
2 gradually 4 tendency **27** ☐ ☐ ☐ ☐



- 28 5 oppisite 7 blossoms 5 6 7 8  
6 prettiest 8 splendid 28 ☐ ☐ ☐ ☐
- 29 1 journal 3 fortunate 1 2 3 4  
2 hearty 4 continually 29 ☐ ☐ ☐ ☐
- 30 5 poet 7 barrel 5 6 7 8  
6 forgotton 8 verses 30 ☐ ☐ ☐ ☐
- 31 1 paradise 3 elaborate 1 2 3 4  
2 inquiry 4 successfully 31 ☐ ☐ ☐ ☐
- 32 5 parden 7 tickled 5 6 7 8  
6 seat 8 ability 32 ☐ ☐ ☐ ☐
- 33 1 bycicle 3 pigeon 1 2 3 4  
2 transferred 4 thorough 33 ☐ ☐ ☐ ☐
- 34 5 courteous 7 liability 5 6 7 8  
6 enclosure 8 merchandize 34 ☐ ☐ ☐ ☐
- 35 1 medium 3 canned 1 2 3 4  
2 desided 4 addition 35 ☐ ☐ ☐ ☐
- 36 5 dismissed 7 apointed 5 6 7 8  
6 happier 8 against 36 ☐ ☐ ☐ ☐
- 37 1 engineers 3 ambition 1 2 3 4  
2 celabrate 4 practicing 37 ☐ ☐ ☐ ☐
- 38 5 semester 7 relize 5 6 7 8  
6 opera 8 whisper 38 ☐ ☐ ☐ ☐
- 39 1 interior 3 discusted 1 2 3 4  
2 drowned 4 sleigh 39 ☐ ☐ ☐ ☐
- 40 5 goverment 7 caution 5 6 7 8  
6 gathering 8 position 40 ☐ ☐ ☐ ☐
- 41 1 stretch 3 temporary 1 2 3 4  
2 certificate 4 exersize 41 ☐ ☐ ☐ ☐
- 42 5 exist 7 interrupt 5 6 7 8  
6 gilty 8 endure 42 ☐ ☐ ☐ ☐

- 43 1 descend 3 boundary 1 2 3 4  
2 sugestions 4 leisure 43 ☐ ☐ ☐ ☐
- 44 5 carriage 7 principal 5 6 7 8  
6 exceptions 8 servent 44 ☐ ☐ ☐ ☐
- 45 1 temperture 3 curious 1 2 3 4  
2 particular 4 grammar 45 ☐ ☐ ☐ ☐
- 46 5 advertisement 7 emergancy 5 6 7 8  
6 institution 8 sacrifice 46 ☐ ☐ ☐ ☐
- 47 1 advantages 3 carring 1 2 3 4  
2 salmon 4 historical 47 ☐ ☐ ☐ ☐
- 48 5 begining 7 continent 5 6 7 8  
6 auditorium 8 knowledge 48 ☐ ☐ ☐ ☐
- 49 1 squirrel 3 receipt 1 2 3 4  
2 affectionately 4 comunities 49 ☐ ☐ ☐ ☐
- 50 5 reasonably 7 wrought 5 6 7 8  
6 equiped 8 graduate 50 ☐ ☐ ☐ ☐
- 51 1 opportunity 3 deny 1 2 3 4  
2 communication 4 originally 51 ☐ ☐ ☐ ☐
- 52 5 struggle 7 discribe 5 6 7 8  
6 horrible 8 composition 52 ☐ ☐ ☐ ☐
- 53 1 apperance 3 benefits 1 2 3 4  
2 definition 4 illustrations 53 ☐ ☐ ☐ ☐
- 54 5 wretched 7 enthusiasm 5 6 7 8  
6 recieving 8 grief 54 ☐ ☐ ☐ ☐
- 55 1 pamphlets 3 acquaint 1 2 3 4  
2 bureau 4 crisis 55 ☐ ☐ ☐ ☐
- 56 5 businesses 7 economics 5 6 7 8  
6 fortune 8 simpathy 56 ☐ ☐ ☐ ☐

No. Right	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	
Gr. Score	Below 20				20	22	23	25	26	28	30	31	34	36	37	39	41	43	44	45	47	48	50	51	53	54	56	57	59	60	62	63	64	66	67	68	69	70	71	73	75	76	77	78	80	82	85	88	92	97	
No. Right (cont'd)	51	52	53	54	55	56																																													
Gr. Score	102	105	110	115	122	129																																													

**DIRECTIONS:** Read each sentence below. Decide which, if either, of the two choices in each sentence is correct in *standard written English*. Look at the answer spaces at the right or on your answer sheet (if you have one). If the choice numbered 1 is correct, fill in the space under the 1. If the choice numbered 2 is correct, fill in the space under the 2. If neither choice 1 nor choice 2 is correct, fill in the space under the N. ("N" stands for "neither.")

**SAMPLES**

A Joe <sup>1 set</sup> in the chair. . . . . A <sup>1</sup> ☐ <sup>2</sup> ☒ N ☐

B Sally <sup>1 ain't</sup> here. . . . . B <sup>1</sup> ☐ <sup>2</sup> ☐ N ☐

- 1 Has the May queen been <sup>1 choosed</sup> yet? 1 ☐ <sup>2</sup> ☐ N ☐
- 2 Why didn't you <sup>1 brought</sup> your old clothes? 2 ☐ <sup>2</sup> ☐ N ☐
- 3 Fred hurt <sup>1 hisself</sup> playing hockey. . . 3 ☐ <sup>2</sup> ☐ N ☐
- 4 Your suitcase fits into the car <sup>1 easy.</sup> 4 ☐ <sup>2</sup> ☐ N ☐
- 5 The ducks have <sup>1 flown</sup> south. . . . . 5 ☐ <sup>2</sup> ☐ N ☐
- 6 How much snow has already <sup>1 fell?</sup> 6 ☐ <sup>2</sup> ☐ N ☐
- 7 Every day last week he <sup>1 comes</sup> to our house. . . . . 7 ☐ <sup>2</sup> ☐ N ☐
- 8 Have you ever <sup>1 blew</sup> bubbles before? 8 ☐ <sup>2</sup> ☐ N ☐
- 9 <sup>1 Them</sup> kind of ice cream is my favorite. 9 ☐ <sup>2</sup> ☐ N ☐
- 10 Have they found <sup>1 they're</sup> pencils? . . . 10 ☐ <sup>2</sup> ☐ N ☐
- 11 Has that horse been <sup>1 ridden</sup> before? . 11 ☐ <sup>2</sup> ☐ N ☐
- 12 Our car has been <sup>1 driven</sup> 75,000 miles. 12 ☐ <sup>2</sup> ☐ N ☐
- 13 Did you already <sup>1 threw</sup> away your old toys? . . . . . 13 ☐ <sup>2</sup> ☐ N ☐
- 14 When he slipped, he <sup>1 is falling</sup> on the ice. . . . . 14 ☐ <sup>2</sup> ☐ N ☐
- 15 An earthquake has <sup>1 shaken</sup> all the houses. . . . . 15 ☐ <sup>2</sup> ☐ N ☐
- 16 A fire truck and <sup>1 a</sup> ambulance roared by. . . . . 16 ☐ <sup>2</sup> ☐ N ☐
- 17 At sunrise the soldiers <sup>1 rose</sup> the flag. 17 ☐ <sup>2</sup> ☐ N ☐

- 18 Do you want <sup>1 that I should</sup> bring my bat? . . . . . 18 ☐ <sup>2</sup> ☐ N ☐
- 19 He is lazy; he <sup>1 lies</sup> in bed all day. . . 19 ☐ <sup>2</sup> ☐ N ☐
- 20 Yesterday I <sup>1 asks</sup> her, "May I go too?" . . . . . 20 ☐ <sup>2</sup> ☐ N ☐
- 21 When I called to <sup>1 him and her,</sup> they came. . . . . 21 ☐ <sup>2</sup> ☐ N ☐
- 22 Billy has <sup>1 drew</sup> a dog in his picture. 22 ☐ <sup>2</sup> ☐ N ☐
- 23 Mr. Ray gave the awards to Bob and <sup>1 I.</sup> 23 ☐ <sup>2</sup> ☐ N ☐
- 24 I <sup>1 haven't</sup> hardly any stamps from India. . . . . 24 ☐ <sup>2</sup> ☐ N ☐
- 25 <sup>1 They was</sup> no time for playing. . . . 25 ☐ <sup>2</sup> ☐ N ☐
- 26 She should never <sup>1 have ate</sup> so much. . 26 ☐ <sup>2</sup> ☐ N ☐
- 27 I don't know why Peg and <sup>1 she</sup> weren't asked. . . . . 27 ☐ <sup>2</sup> ☐ N ☐
- 28 When the line <sup>1 breaks,</sup> the fish escaped. . . . . 28 ☐ <sup>2</sup> ☐ N ☐
- 29 If you had spoken, I would <sup>1 of known</sup> you. . . . . 29 ☐ <sup>2</sup> ☐ N ☐
- 30 I don't know how long I had <sup>1 lain</sup> there. . . . . 30 ☐ <sup>2</sup> ☐ N ☐
- 31 By noon, water <sup>1 had rose</sup> above the dikes. . . . . 31 ☐ <sup>2</sup> ☐ N ☐
- 32 I would <sup>1 have went</sup> with you last week. 32 ☐ <sup>2</sup> ☐ N ☐
- 33 Which one of the boys <sup>1 is</sup> going first? 33 ☐ <sup>2</sup> ☐ N ☐
- 34 There <sup>1 goes</sup> the jet planes. . . . . 34 ☐ <sup>2</sup> ☐ N ☐
- 35 For years the men <sup>1 has spoken</sup> to no one. . . . . 35 ☐ <sup>2</sup> ☐ N ☐
- 36 Enter the room <sup>1 more quiet</sup> next time. 36 ☐ <sup>2</sup> ☐ N ☐
- 37 Which of the twins can swim the <sup>1 faster?</sup> 37 ☐ <sup>2</sup> ☐ N ☐
- 38 The coach asked <sup>1 me and Tom</sup> to report. . . . . 38 ☐ <sup>2</sup> ☐ N ☐



DIRECTIONS: In this part, all punctuation marks and capital letters have been left out. Decide which mark of punctuation, if any, is needed after each *underlined* word. If a punctuation mark is needed, find the punctuation mark in the row at the right that has the same number as the underlined word. Then look at the answer spaces at the right or on your answer sheet (if you have one). Fill in the space which has the same letter as the letter beside the punctuation mark you have chosen. If no punctuation mark is needed, fill in the space under the NP. ("NP" stands for "no punctuation needed.")

SAMPLES

yesterday we had a <sup>C</sup>holiday

mother served <sup>D</sup>cake and ice cream

	a	b	NP
C	a (.)	b (,)	<input checked="" type="radio"/> <input type="radio"/> <input type="radio"/>
	c	d	NP
D	c (.)	d (,)	<input type="radio"/> <input type="radio"/> <input type="radio"/>

a hundred dollars to spend

<sup>39</sup>mr sanders do you mean this hundred dollars is all <sup>40</sup>mine i <sup>41</sup>asked

my eyes popping when the banker told <sup>42</sup>me that i had won the <sup>43</sup>award

then i thanked him and took the <sup>44</sup>crisp one hundred dollar bill

one hundred <sup>45</sup>dollars how would i spend <sup>46</sup>it i have always wanted

<sup>47</sup>a horse but in our apartment where could we keep a <sup>48</sup>horse <sup>49</sup>no i would

have to postpone that dream

my father <sup>50</sup>said you should invest half of <sup>51</sup>it i will help you to buy

some stocks

then i remembered the jimmy fund i sent five <sup>52</sup>dollars to this worthy

cause with some of the forty-five dollars left i bought camping equip-

ment i got a sleeping <sup>53</sup>bag a knapsack and a mess kit

coming out of the sports <sup>54</sup>store i stopped outside a pet shop in the

window was a <sup>55</sup>black and white puppy he was just begging me to buy

him since you can have a puppy even in an <sup>56</sup>apartment i could not resist

that hundred dollars went fast but it bought a lot of happiness

	a	b	NP
39	a (,)	b (?)	<input type="radio"/> <input type="radio"/> <input type="radio"/>
	c	d	NP
40	c (?)	d (")	<input type="radio"/> <input type="radio"/> <input type="radio"/>
	a	b	NP
41	a (.)	b (,)	<input type="radio"/> <input type="radio"/> <input type="radio"/>
	c	d	NP
42	c (,)	d (,")	<input type="radio"/> <input type="radio"/> <input type="radio"/>
	a	b	NP
43	a (.)	b (,)	<input type="radio"/> <input type="radio"/> <input type="radio"/>
	c	d	NP
44	c (,)	d (;)	<input type="radio"/> <input type="radio"/> <input type="radio"/>
	a	b	NP
45	a (!)	b (?)	<input type="radio"/> <input type="radio"/> <input type="radio"/>
	c	d	NP
46	c (!)	d (?)	<input type="radio"/> <input type="radio"/> <input type="radio"/>
	a	b	NP
47	a (,)	b (,")	<input type="radio"/> <input type="radio"/> <input type="radio"/>
	c	d	NP
48	c (.)	d (?)	<input type="radio"/> <input type="radio"/> <input type="radio"/>
	a	b	NP
49	a (,)	b (,")	<input type="radio"/> <input type="radio"/> <input type="radio"/>
	c	d	NP
50	c (,")	d (,)	<input type="radio"/> <input type="radio"/> <input type="radio"/>
	a	b	NP
51	a (.)	b (,")	<input type="radio"/> <input type="radio"/> <input type="radio"/>
	c	d	NP
52	c (.)	d (,)	<input type="radio"/> <input type="radio"/> <input type="radio"/>
	a	b	NP
53	a (.)	b (,)	<input type="radio"/> <input type="radio"/> <input type="radio"/>
	c	d	NP
54	c (.)	d (,)	<input type="radio"/> <input type="radio"/> <input type="radio"/>
	a	b	NP
55	a (.)	b (,)	<input type="radio"/> <input type="radio"/> <input type="radio"/>
	c	d	NP
56	c (.)	d (,)	<input type="radio"/> <input type="radio"/> <input type="radio"/>

DIRECTIONS: In this part, all capital letters and most of the punctuation marks have been left out. You are to decide whether certain words should be capitalized. These words are *underlined* and have a number above them. You are not to do anything with words that are not underlined. Look at the answer spaces at the right or on your answer sheet (if you have one). Be sure that the number beside the answer space agrees with the number of the word. If the word or phrase should be capitalized, fill in the space under the letter C. ("C" stands for "capital letter.") If a small letter is correct, fill in the space under the letter s. ("s" stands for "small letter.")

## SAMPLES

<sup>E</sup>  
mary and tom are going

<sup>F</sup>  
they will leave tomorrow

E    C   s  
     ●   ○

F    C   s  
     ○   ○

our class has been studying the <sup>57</sup>history and <sup>58</sup>geography of <sup>59</sup>germany we are learning many interesting facts for example we have read about famous german <sup>60</sup>musicians and <sup>61</sup>scientists we also studied the events of <sup>62</sup>world <sup>63</sup>war II i was especially interested in this because my <sup>64</sup>father was a <sup>65</sup>sergeant in the <sup>66</sup>air <sup>67</sup>force after the <sup>68</sup>war he was stationed in <sup>69</sup>west <sup>70</sup>berlin

in 1945 germany was defeated the <sup>71</sup>nazi <sup>72</sup>dictator adolf hitler was dead the germans had no <sup>73</sup>government for several years the united states france and britain were the government in <sup>74</sup>western <sup>75</sup>germany in the eastern zone <sup>76</sup>russian <sup>77</sup>troops took over

several pupils in our class have <sup>78</sup>pen <sup>79</sup>pals in west germany i write to a girl named marta who lives in a small town on the <sup>80</sup>rhine <sup>81</sup>river near the <sup>82</sup>capital bonn marta wrote to me about their <sup>83</sup>christmas <sup>84</sup>celebration it is something like ours they go to midnight mass and sing <sup>85</sup>carols marta's family are <sup>86</sup>roman <sup>87</sup>catholic marta's father is a <sup>88</sup>professor at the <sup>89</sup>university of <sup>90</sup>frankfurt she sent me a present it is a book of <sup>91</sup>fairy tales by the <sup>92</sup>brothers grimm

C   s  
57 ○ ○

C   s  
58 ○ ○

C   s  
59 ○ ○

C   s  
60 ○ ○

C   s  
61 ○ ○

C   s  
62 ○ ○

C   s  
63 ○ ○

C   s  
64 ○ ○

C   s  
65 ○ ○

C   s  
66 ○ ○

C   s  
67 ○ ○

C   s  
68 ○ ○

C   s  
69 ○ ○

C   s  
70 ○ ○

C   s  
71 ○ ○

C   s  
72 ○ ○

C   s  
73 ○ ○

C   s  
74 ○ ○

C   s  
75 ○ ○

C   s  
76 ○ ○

C   s  
77 ○ ○

C   s  
78 ○ ○

C   s  
79 ○ ○

C   s  
80 ○ ○

C   s  
81 ○ ○

C   s  
82 ○ ○

C   s  
83 ○ ○

C   s  
84 ○ ○

C   s  
85 ○ ○

C   s  
86 ○ ○

C   s  
87 ○ ○

C   s  
88 ○ ○

C   s  
89 ○ ○

C   s  
90 ○ ○

C   s  
91 ○ ○

C   s  
92 ○ ○



**DIRECTIONS:** This is a test of your ability to use a dictionary. There are two sections. In this section four words (in boxes) are shown as they might appear in a dictionary, with four definitions given for each word. Below the box for each word are four questions. In the first two questions, the given word is used in a sentence. Read each sentence, then decide which dictionary definition *best* defines the word as it is being used in the sentence. Look at the answer spaces at the right or on your answer sheet (if you have one). Fill in the space which has the same *number* as the definition you have chosen. Two other questions are asked about each word. For each of these, decide which answer is *best* and mark the space which has the same *letter* as the answer you have chosen.

## SAMPLES

**check** (chek) 1. *n.* A pattern in squares of different colors. 2. *v.* To prove true or right. 3. *n.* A mark showing that something has been examined or compared. 4. *v.* To hold back or control.

G Miss Jones made a **check** beside each example.

1 2 3 4  
G ☐ ☐ ☒ ☐

H The word **check** in the sentence above is —

a a noun      b a verb      c an adjective      d an adverb

a b c d  
H ☐ ☐ ☐ ☐

**fortune** (fôr'chən) *n.* 1. Great deal of money or property; riches; wealth. 2. Luck; chance; what happens. 3. Good luck; success; prosperity. 4. Fate; destiny; what is going to happen.

93 The young man went West to seek a **fortune** in the gold rush.

1 2 3 4  
93 ☐ ☐ ☐ ☐

94 The gypsy told the girl's **fortune** by reading tea leaves.

1 2 3 4  
94 ☐ ☐ ☐ ☐

95 **Fortune** is the root word (or stem) for all the following except —

a fortunate      b unfortunately      c fortress      d misfortune

a b c d  
95 ☐ ☐ ☐ ☐

96 The second definition of **fortune** applies to all the following except —

e "wheel of fortune"      g "What fortune befell the hero?"  
f "a fortune in jewels"      h "by bad fortune"

e f g h  
96 ☐ ☐ ☐ ☐

**inspiration** (in' spə rā' shən) *n.* 1. Influence of thought and strong feelings on action. 2. Influence from God which helped men to write the Bible. 3. An idea that is inspired. 4. Breathing in; drawing air into the lungs.

97 Tom had an **inspiration**; he attached the wire to the cylinder.

1 2 3 4  
97 ☐ ☐ ☐ ☐

98 The **inspiration** to write that poem came from the poet's mother.

1 2 3 4  
98 ☐ ☐ ☐ ☐

99 On which syllable is the word **inspiration** strongly accented?

a first      b second      c third      d fourth

a b c d  
99 ☐ ☐ ☐ ☐

100 A word that means the opposite of one meaning of **inspiration** is —

e inspirational      f expiration      g expectation      h unintentional

e f g h  
100 ☐ ☐ ☐ ☐

**bitter** (bit'ər) *adj.* 1. Having a disagreeable taste like quinine or grass. 2. Painful; distressing. 3. Showing grief or pain. 4. Harsh; cruel; stinging; cutting. *adv.* **bitterly**.

101 When Mary heard the news, she wept **bitterly**.

1 2 3 4  
101 ☐ ☐ ☐ ☐

102 The old captain had a **bitter** tongue.

1 2 3 4  
102 ☐ ☐ ☐ ☐

103 All the following are correct uses of **bitter** except —

a "bitter pill"      b "bitter street"      c "bitter wind"      d "bitter tears"

a b c d  
103 ☐ ☐ ☐ ☐

104 **Soft** and **gentle** are antonyms (words that mean the opposite) of **bitter** when it has the meaning given in definition number —

e 1      f 2      g 3      h 4

e f g h  
104 ☐ ☐ ☐ ☐



**nar row** (nar'ō) 1. *adj.* Less wide than usual for its kind. 2. *adj.* Limited, small. 3. *v.* To decrease in width. 4. *adj.* Close; with a small margin.

105 Jim had a narrow escape from the runaway horse.

105 ☐ 1 ☐ 2 ☐ 3 ☐ 4

106 The sign warns motorists that the road narrows.

106 ☐ 1 ☐ 2 ☐ 3 ☐ 4

107 The first definition fits the use of narrow in all the following phrases except —

a "narrow ribbon"      b "a narrow road"      c "narrow-minded"      d "a narrow hall"

107 ☐ a ☐ b ☐ c ☐ d

108 All the definitions of narrow explain its use as an adjective except the definition numbered —

e 1      f 2      g 3      h 4

108 ☐ e ☐ f ☐ g ☐ h

**DIRECTIONS:** In each sentence in this section, you are to decide how to pronounce the underlined word. Do not depend upon the way you think the word is pronounced. Use the pronunciation guide at the foot of this page to help you. Choose the word or phrase that completes the sentence *best*, and then in the answer spaces at the right or on your answer sheet (if you have one) mark the space which has the same number.

### SAMPLES

I Rein (rān) rhymes with —

1 plan      2 main      3 fawn      4 men

I ☐ 1 ☒ 2 ☐ 3 ☐ 4

J The vowel sound in cough (kôf) is the same as the vowel sound in —

5 couch      6 corn      7 hot      8 hope

J ☐ 5 ☐ 6 ☐ 7 ☐ 8

109 The word even (ē'vən) contains —

1 a short "e" sound      2 a syllable that rhymes with seen      3 a long "e" sound      4 an initial vowel sound like that in ever

109 ☐ 1 ☐ 2 ☐ 3 ☐ 4

110 The first three letters in thrall (thrôl) have the same sound as the first letters in —

5 through      6 this      7 thou      8 that

110 ☐ 5 ☐ 6 ☐ 7 ☐ 8

111 Fissure (fish'ər) rhymes most closely with —

1 this year      2 pressure      3 tissue      4 wisher

111 ☐ 1 ☐ 2 ☐ 3 ☐ 4

112 The word solder (sod'ər) contains —

5 a silent letter      6 the sound of "o" as in soda      7 two unaccented vowels      8 a diphthong

112 ☐ 5 ☐ 6 ☐ 7 ☐ 8

113 The word beau (bō) is pronounced the same as —

1 the first syllable of beauty      2 a blue bow      3 bow to the lady      4 to cry "boo"

113 ☐ 1 ☐ 2 ☐ 3 ☐ 4

114 In the word moderation (mod'ər ā' shən) there are —

5 more than two accented syllables      6 one heavily and one lightly accented syllable      7 two heavily accented syllables      8 two lightly accented syllables

114 ☐ 5 ☐ 6 ☐ 7 ☐ 8

115 Sieve (siv) rhymes with —

1 siege      2 thrive      3 give      4 sift

115 ☐ 1 ☐ 2 ☐ 3 ☐ 4

116 The vowel sound in the accented syllable in broaden (brôd'ən) is like the accented vowel sound in —

5 brawn      6 broiling      7 broker      8 brown

116 ☐ 5 ☐ 6 ☐ 7 ☐ 8

**DIRECTIONS:** Read each group of words below. Decide if the words make *one complete sentence*, *more than one complete sentence*, or *no complete sentence*. Look at the answer spaces at the right or on your answer sheet (if you have one). If the group of words *can* be correctly punctuated as one sentence by merely putting a period or question mark at the end, fill in the space under the 1. If the group of words *could* be punctuated as two sentences (without changing or omitting any words), fill in the space under the 2. If the group of words is just part of a sentence, fill in the space under the N. ("N" stands for "not a complete sentence.")

SAMPLES

K In 1818 the flag had twenty stars . . . K ☒ 1 ☐ 2 ☐ N

L In the right-hand corner of the flag . . . L ☐ 1 ☐ 2 ☐ N

117 Autumn is my favorite season of the year . . . 117 ☐ 1 ☐ 2 ☐ N

118 Going back to school, meeting old friends and new teachers . . . 118 ☐ 1 ☐ 2 ☐ N

119 Not that summer vacation isn't fun, too, with beach parties and baseball games to go to . . . 119 ☐ 1 ☐ 2 ☐ N

120 Autumn, however, has so many pleasures I mean there are many holidays . . . 120 ☐ 1 ☐ 2 ☐ N

121 At school we celebrate these occasions in many different ways . . . 121 ☐ 1 ☐ 2 ☐ N

122 Such as planning for our class Halloween party . . . 122 ☐ 1 ☐ 2 ☐ N

123 We decorate the room, bring refreshments, and plan special programs . . . 123 ☐ 1 ☐ 2 ☐ N

124 Last year a prize was given for the best decorated room . . . 124 ☐ 1 ☐ 2 ☐ N

125 Since our room was decorated with skeletons, wicked-looking witches, yellow pumpkins, and black cats . . . 125 ☐ 1 ☐ 2 ☐ N

126 We thought that we would win the prize however the sixth grade was the winner . . . 126 ☐ 1 ☐ 2 ☐ N

127 So this year we'll try even harder we may win . . . 127 ☐ 1 ☐ 2 ☐ N

128 There are many other wonderful things to do in the fall there are hay rides and football games . . . 128 ☐ 1 ☐ 2 ☐ N

129 Also the weather, which in New England is usually clear and cool . . . 129 ☐ 1 ☐ 2 ☐ N

130 And the bright colors of the falling leaves . . . 130 ☐ 1 ☐ 2 ☐ N

131 Raking the leaves into piles and jumping into the piles . . . 131 ☐ 1 ☐ 2 ☐ N

132 The smell of burning leaves fills the air . . . 132 ☐ 1 ☐ 2 ☐ N

133 Also in autumn we play football it is my favorite sport . . . 133 ☐ 1 ☐ 2 ☐ N

134 I look forward to doing all these things with my friends whom I haven't seen during the summer . . . 134 ☐ 1 ☐ 2 ☐ N

STOP

No. Right	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50												
Gr. Score																														Below 20		20	20	20	21	21	22	22	23	23	24	24	25	25	25	26	26	27	28	28	29	29										
No. Right (cont'd)	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100												
Gr. Score	30	31	31	32	32	33	33	34	34	35	36	37	37	38	39	40	41	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	69	70	71	72	73	74	75	77	79											
No. Right (cont'd)	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134																												
Gr. Score	80	82	85	88	90	93	95	97	98	100	102	104	105	107	108	109	110	111	113	114	115	117	118	119	120	121	123	124	125	126	127	129	129+																													



DIRECTIONS: Work the example in each box. Then look at the possible answers at the right side of the box and see if your answer is given. If it is, fill in the space at the right or on your answer sheet (if you have one) which has the same letter as the answer you have chosen. If your answer is *not* given, fill in the space which has the same letter as the letter beside the NG (which means "not given"). Use a separate sheet of paper for figuring.

SAMPLE A

$$\begin{array}{r} 64 \\ - 23 \\ \hline 41 \end{array}$$

- a 31  
b 40  
c 41  
d 42  
e NG

A ☐ a ☐ b ☒ c ☐ d ☐ e

1

$$3 \overline{)174}$$

- a 54, rem 2  
b 58  
c 57  
d 61, rem 1  
e NG

2

$$\begin{array}{r} 359 \\ 77 \\ 798 \\ + 79 \\ \hline \end{array}$$

- f 1212  
g 1213  
h 1303  
i 1312  
j NG

3

$$\begin{array}{r} \$6.05 \\ - 5.67 \\ \hline \end{array}$$

- a \$.38  
b \$.48  
c \$1.38  
d \$1.48  
e NG

1 ☐ a ☐ b ☐ c ☐ d ☐ e

2 ☐ f ☐ g ☐ h ☐ i ☐ j

3 ☐ a ☐ b ☐ c ☐ d ☐ e

4

$$\begin{array}{r} 359 \\ 7495 \\ + 5788 \\ \hline \end{array}$$

- f 12,642  
g 13,542  
h 13,642  
i 13,632  
j NG

5

$$\begin{array}{r} 10183 \\ - 2694 \\ \hline \end{array}$$

- a 7489  
b 7487  
c 7589  
d 8489  
e NG

6

$$\begin{array}{r} 14515 \\ - 8936 \\ \hline \end{array}$$

- f 5589  
g 5679  
h 5689  
i 6579  
j NG

4 ☐ f ☐ g ☐ h ☐ i ☐ j

5 ☐ a ☐ b ☐ c ☐ d ☐ e

6 ☐ f ☐ g ☐ h ☐ i ☐ j

7

$$\begin{array}{r} 435 \\ \times 45 \\ \hline \end{array}$$

- a 18,575  
b 19,375  
c 20,575  
d 19,575  
e NG

8

$$\begin{array}{r} 96 \\ \times 78 \\ \hline \end{array}$$

- f 7468  
g 7478  
h 7488  
i 7588  
j NG

9

$$5 \overline{)3015}$$

- a 60, rem 3  
b 603  
c 63  
d 605  
e NG

7 ☐ a ☐ b ☐ c ☐ d ☐ e

8 ☐ f ☐ g ☐ h ☐ i ☐ j

9 ☐ a ☐ b ☐ c ☐ d ☐ e

10

$$\begin{array}{r} 13803 \\ - 7957 \\ \hline \end{array}$$

- f 5846  
g 5836  
h 5746  
i 6846  
j NG

11

$$\begin{array}{r} 6677 \\ 9998 \\ + 7568 \\ \hline \end{array}$$

- a 23,243  
b 24,143  
c 24,243  
d 24,233  
e NG

12

$$\begin{array}{r} 758 \\ 7668 \\ + 8789 \\ \hline \end{array}$$

- f 16,215  
g 17,115  
h 17,205  
i 17,215  
j NG

10 ☐ f ☐ g ☐ h ☐ i ☐ j

11 ☐ a ☐ b ☐ c ☐ d ☐ e

12 ☐ f ☐ g ☐ h ☐ i ☐ j

13

$$9 \overline{)8802}$$

- a  $911\frac{3}{9}$   
b 978  
c 977  
d  $989\frac{1}{9}$   
e NG

14

$$\begin{array}{r} 423 \\ \times 302 \\ \hline \end{array}$$

- f 13,536  
g 127,446  
h 137,746  
i 127,746  
j NG

15

$$24 \overline{)848}$$

- a 35  
b  $35\frac{1}{8}$   
c  $35\frac{1}{4}$   
d  $35\frac{3}{8}$   
e NG

13 ☐ a ☐ b ☐ c ☐ d ☐ e

14 ☐ f ☐ g ☐ h ☐ i ☐ j

15 ☐ a ☐ b ☐ c ☐ d ☐ e

16

$$\frac{2}{3} + \frac{2}{3} =$$

- f  $\frac{4}{9}$   
g  $\frac{3}{4}$   
h  $1\frac{1}{3}$   
i  $1\frac{1}{4}$   
j NG

17

What is the average of 4, 7, 3, 6?

- a 4  
b 5  
c 7  
d 20  
e NG

18

$$48 \overline{)3792}$$

- f  $76\frac{4}{48}$   
g 79  
h  $79\frac{10}{48}$   
i 709  
j NG

16 ☐ f ☐ g ☐ h ☐ i ☐ j

17 ☐ a ☐ b ☐ c ☐ d ☐ e

18 ☐ f ☐ g ☐ h ☐ i ☐ j

19

$$\begin{array}{r} 8 \overline{)4860} \end{array}$$

- a  $60\frac{3}{4}$
- b  $67\frac{1}{2}$
- c 607
- d  $607\frac{1}{2}$
- e NG

20

$$\begin{array}{r} 748 \\ \times 860 \\ \hline \end{array}$$

- f 10,472
- g 10,572
- h 643,280
- i 642,280
- j NG

21

$$\begin{array}{r} 78 \overline{)6715} \end{array}$$

- a  $86\frac{7}{78}$
- b  $86\frac{17}{78}$
- c  $88\frac{71}{78}$
- d  $89\frac{73}{78}$
- e NG

a b c d e

19 ☐ ☐ ☐ ☐ ☐

f g h i j

20 ☐ ☐ ☐ ☐ ☐

a b c d e

21 ☐ ☐ ☐ ☐ ☐

22

$$\begin{array}{r} \frac{1}{4} \\ + 1\frac{2}{3} \\ \hline \end{array}$$

- f  $1\frac{3}{4}$
- g 2
- h  $1\frac{11}{12}$
- i  $2\frac{1}{3}$
- j NG

23

$$\begin{array}{r} 1\frac{1}{6} \\ - \frac{1}{2} \\ \hline \end{array}$$

- a  $\frac{1}{2}$
- b  $\frac{3}{4}$
- c  $1\frac{1}{4}$
- d  $1\frac{1}{6}$
- e NG

24

$$\frac{3}{5} \times 10 =$$

- f 6
- g  $10\frac{3}{5}$
- h  $16\frac{2}{3}$
- i 30
- j NG

f g h i j

22 ☐ ☐ ☐ ☐ ☐

a b c d e

23 ☐ ☐ ☐ ☐ ☐

f g h i j

24 ☐ ☐ ☐ ☐ ☐

25

$$5 \times 0.25 =$$

- a 0.05
- b 0.5
- c 1.25
- d 5.0
- e NG

26

$$\frac{2}{5} \times \frac{1}{4} =$$

- f  $\frac{3}{9}$
- g  $\frac{1}{10}$
- h  $\frac{3}{20}$
- i  $1\frac{2}{5}$
- j NG

27

$$\begin{array}{r} 5 \text{ ft. } 8 \text{ in.} \\ + 3 \text{ ft. } 8 \text{ in.} \\ \hline \end{array}$$

- a 8 ft. 4 in.
- b 8 ft. 6 in.
- c 9 ft. 6 in.
- d 9 ft. 4 in.
- e NG

a b c d e

25 ☐ ☐ ☐ ☐ ☐

f g h i j

26 ☐ ☐ ☐ ☐ ☐

a b c d e

27 ☐ ☐ ☐ ☐ ☐

28

$$\begin{array}{r} 112 \\ \times 1.5 \\ \hline \end{array}$$

- f 1.680
- g 16.80
- h 168.0
- i 1680
- j NG

29

$$2\frac{2}{5} - 1\frac{4}{5} =$$

- a  $\frac{3}{5}$
- b  $\frac{2}{5}$
- c  $1\frac{2}{5}$
- d  $1\frac{3}{5}$
- e NG

30

$$\frac{2}{3} \div \frac{1}{6} =$$

- f 4
- g  $\frac{1}{4}$
- h  $\frac{2}{9}$
- i 12
- j NG

f g h i j

28 ☐ ☐ ☐ ☐ ☐

a b c d e

29 ☐ ☐ ☐ ☐ ☐

f g h i j

30 ☐ ☐ ☐ ☐ ☐

31

What is the average of 15 in., 12 in., 21 in.?

- a 12 in.
- b 16 in.
- c 21 in.
- d 48 in.
- e NG

32

$$12 \div \frac{3}{4} =$$

- f  $\frac{1}{16}$
- g  $\frac{4}{4}$
- h  $12\frac{3}{4}$
- i 16
- j NG

33

$$2.48 \div 4 =$$

- a .062
- b 0.62
- c 6.2
- d 62
- e NG

a b c d e

31 ☐ ☐ ☐ ☐ ☐

f g h i j

32 ☐ ☐ ☐ ☐ ☐

a b c d e

33 ☐ ☐ ☐ ☐ ☐

34

$$\begin{array}{r} \$87.49 \\ \times 79 \\ \hline \end{array}$$

- f \$6911.71
- g \$6811.71
- h \$6901.71
- i \$7911.71
- j NG

35

$$\frac{1}{3} \text{ of } 4 \text{ ft. } 3 \text{ in.} =$$

- a 1 ft. 1 in.
- b 1 ft. 4 in.
- c 1 ft. 5 in.
- d 1 ft. 13 in.
- e NG

36

$$8 \div 0.4 =$$

- f .32
- g 20
- h 5
- i 2.0
- j NG

f g h i j

34 ☐ ☐ ☐ ☐ ☐

a b c d e

35 ☐ ☐ ☐ ☐ ☐

f g h i j

36 ☐ ☐ ☐ ☐ ☐

37

What is 20% of 40?

- a 8
- b 2
- c 5
- d 20
- e NG

38

What is the quotient rounded to tenths?

$$\begin{array}{r} 35 \overline{)163} \end{array}$$

- f 4.2
- g 4.4
- h 4.6
- i 4.7
- j 4.8

39

20 is what per cent of 80?

- a 4
- b 20
- c 40
- d 25
- e NG

a b c d e

37 ☐ ☐ ☐ ☐ ☐

f g h i j

38 ☐ ☐ ☐ ☐ ☐

a b c d e

39 ☐ ☐ ☐ ☐ ☐

STOP

# TEST 6: Arithmetic Concepts

**DIRECTIONS:** Read each question. Decide which of the answers given below is correct. Look at the answer spaces at the right or on your answer sheet (if you have one). Fill in the space which has the same letter as the answer you have chosen.

## SAMPLE

A A dime is worth how many cents?

a 2  
b 5

c 10  
d 25


a b c d  
A ☐ ☐ ☒ ☐

1 Which term does not belong in this set?

a twenty-five  
b forty

c ninety  
d ten

a b c d  
1 ☐ ☐ ☐ ☐

2  What fractional part of this figure is shaded?

e  $\frac{1}{3}$   
f  $\frac{1}{2}$

g  $\frac{2}{3}$   
h  $\frac{3}{4}$

e f g h  
2 ☐ ☐ ☐ ☐

3 Which of the following is fourteen thousand fourteen?

a 14,14  
b 14,014

c 140,014  
d 1,400,014

a b c d  
3 ☐ ☐ ☐ ☐

4 By estimation, choose the example that will have the largest product.

e  $8 \times 1379$   
f  $8 \times 1388$

g  $8 \times 1475$   
h  $8 \times 1476$

e f g h  
4 ☐ ☐ ☐ ☐

5 In the number 1382, place value makes which digit worth most?

a 2  
b 1

c 3  
d 8

a b c d  
5 ☐ ☐ ☐ ☐

6 Which is the smallest common denominator for  $\frac{1}{4}$  and  $\frac{1}{6}$ ?

e 4  
f 6

g 12  
h 24

e f g h  
6 ☐ ☐ ☐ ☐

7 What is the average of 6 and 10?

a 4  
b 8

c 7  
d 16

a b c d  
7 ☐ ☐ ☐ ☐

8 If N minus 6 is 8, what could be the value of N?

e 2  
f 6

g 8  
h 14

e f g h  
8 ☐ ☐ ☐ ☐

9  $12 - 8 = \boxed{\phantom{00}}$  Which numbers, if put in the box, would make the sentence true?

a  $6 - 4$   
b  $2 + 4$

c  $10 - 6$   
d  $4 + 4$

a b c d  
9 ☐ ☐ ☐ ☐

10 In which figure are all angles equal?



e f g h  
10 ☐ ☐ ☐ ☐

11 What is the value of N if  $\frac{N}{25} = \frac{80}{100}$ ?

a 50  
b  $2\frac{1}{2}$

c 20  
d 80

a b c d  
11 ☐ ☐ ☐ ☐

12 In which of the following has the 6 the greatest value?

e 64  
f 3.46

g 6.432  
h 56

e f g h  
12 ☐ ☐ ☐ ☐

13 This set of numbers has a certain relationship. 48 24 12 6 Which number comes next?

a 5  
b 3

c 1  
d 0

a b c d  
13 ☐ ☐ ☐ ☐

14 Bob's answer for an addition example was 5647. The 6 should have been 8. How large was his error?

e 2  
f 20

g 200  
h 2000

e f g h  
14 ☐ ☐ ☐ ☐

15 One third of what number is 6?

a 2  
b 3

c 12  
d 18

a b c d  
15 ☐ ☐ ☐ ☐



16 Which of the following means 8 tens, 3 ones, and 5 hundreds?

- e 583      g 853      e   f   g   h  
f 835      h 538      16 ☐ ☐ ☐ ☐

17  $3\frac{1}{2}$  equals —

- a  $0.3\frac{1}{2}$       c 3.50      a   b   c   d  
b  $3.00\frac{1}{2}$       d  $0.003\frac{1}{2}$       17 ☐ ☐ ☐ ☐

18 What is the multiplicand if the product is 12 and the multiplier is 2?

- e 2      g 6      e   f   g   h  
f 12      h 24      18 ☐ ☐ ☐ ☐

19 Which fraction is expressed in lowest terms?

- a  $\frac{29}{291}$       c  $\frac{405}{6000}$       a   b   c   d  
b  $\frac{486}{1350}$       d  $\frac{93}{153}$       19 ☐ ☐ ☐ ☐

20 How many hours pass from 11:15 A.M. to 1:30 P.M.?

- e  $2\frac{1}{4}$       g  $2\frac{3}{4}$       e   f   g   h  
f  $2\frac{1}{2}$       h  $9\frac{3}{4}$       20 ☐ ☐ ☐ ☐

21 What does LXIV mean?


- a 5115      c 1104      a   b   c   d  
b 64      d 514      21 ☐ ☐ ☐ ☐

22 What is 3752 rounded to thousands?

- e 3700      g 4000      e   f   g   h  
f 3750      h 3800      22 ☐ ☐ ☐ ☐

23 Which of these fractional parts is the largest?

- a  $\frac{3}{7}$       c  $\frac{4}{9}$       a   b   c   d  
b  $\frac{4}{7}$       d  $\frac{2}{9}$       23 ☐ ☐ ☐ ☐

24  What per cent of this figure is shaded?

- e 4      g 40      e   f   g   h  
f 25      h 50      24 ☐ ☐ ☐ ☐

25 If  $x$  is some number greater than zero, which is  $x \div x$ ?

- a 1      c less than 1      a   b   c   d  
b 0      d more than 1      25 ☐ ☐ ☐ ☐

26 What is 0.197 rounded to hundredths?

- e 0.2      g 0.19      e   f   g   h  
f 0.20      h 0.198      26 ☐ ☐ ☐ ☐

27 What is 4 divided by 8?

- a  $\frac{1}{2}$       c 2      a   b   c   d  
b  $\frac{1}{4}$       d 32      27 ☐ ☐ ☐ ☐

28 What is the difference between a temperature of  $12^\circ$  above zero and  $8^\circ$  below zero?

- e  $4^\circ$       g  $12^\circ$       e   f   g   h  
f  $8^\circ$       h  $20^\circ$       28 ☐ ☐ ☐ ☐

29 Which of the following cannot be divided (without a remainder) excepting by itself and 1?

- a 37      c 51      a   b   c   d  
b 24      d 68      29 ☐ ☐ ☐ ☐

30 4 is what per cent of 8?

- e 2      g 200      e   f   g   h  
f 5      h 50      30 ☐ ☐ ☐ ☐

31  $0.04 \times 9.8$  is approximately —

- a 0.04      c 4      a   b   c   d  
b 0.4      d 40      31 ☐ ☐ ☐ ☐

32  $4330 \div 34.64 =$

- e 0.125      g 12.5      e   f   g   h  
f 1.25      h 125      32 ☐ ☐ ☐ ☐

# TEST 7: Arithmetic Applications

**DIRECTIONS:** Work each problem. Then look at the possible answers under the problem and see if your answer is given. If it is, fill in the answer space at the right or on your answer sheet (if you have one) which has the same letter as the answer you have chosen. If your answer is not given, fill in the space which has the same letter as the letter beside NG (which means "not given"). If NG is not listed for an example, one of the given answers is the correct answer. There is no sales tax in any problem on the test unless you are told otherwise. Use a separate sheet of paper for all figuring.

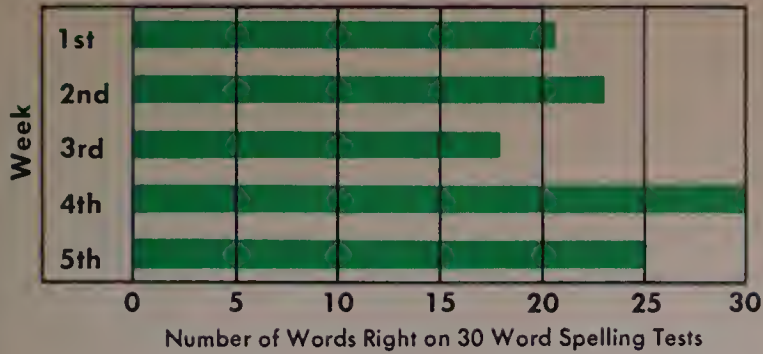
- 1 One hundred fifty children come to school on three buses. What is the average number of children on a bus?  
 a 30                      b 50                      c 100                      d 450                      e NG                      1 ☐ a ☐ b ☐ c ☐ d ☐ e
- 2 Candy bars are 6 for 25¢. How many could you buy for \$1.00?  
 f 12                      g 30                      h 24                      i 60                      j NG                      2 ☐ f ☐ g ☐ h ☐ i ☐ j
- 3 Adults' tickets are 90¢ and children's are 35¢. How much will 3 children's and 2 adults' tickets cost?  
 a \$2.85                      b \$1.25                      c \$1.80                      d \$1.05                      e NG                      3 ☐ a ☐ b ☐ c ☐ d ☐ e
- 4 Tony can stay a quarter of an hour. That is —  
 f 10 min.                      g 15 min.                      h 25 min.                      i 30 min.                      j NG                      4 ☐ f ☐ g ☐ h ☐ i ☐ j
- 5 Dick bought one toy at 70¢ and one at 85¢. He gave the clerk \$2.00. How much change should he get back?  
 a 45¢                      b 15¢                      c 83¢                      d \$1.55                      e NG                      5 ☐ a ☐ b ☐ c ☐ d ☐ e
- 6 How much did Andy spend in all? He bought 2 fish at 30¢ each and 2 boxes of fish food at 25¢ each.  
 f 55¢                      g 80¢                      h 85¢                      i \$1.10                      j NG                      6 ☐ f ☐ g ☐ h ☐ i ☐ j

Today is Bank Day at school. Here are some of our money problems.

- 7 Betty's average deposit is 50¢ per week. What would the total for 25 weeks be?  
 a 75¢                      b \$5.00                      c \$25.50                      d \$125.00                      e NG                      7 ☐ a ☐ b ☐ c ☐ d ☐ e
- 8 Total deposits this week are \$8.25. Don says that is 75¢ more than last week. What was last week's amount?  
 f \$7.50                      g \$7.00                      h \$7.75                      i \$9.00                      j NG                      8 ☐ f ☐ g ☐ h ☐ i ☐ j
- 9 The first two deposits were for 25¢ each and the next three for 50¢ each. How much is this in all?  
 a 50¢                      b 75¢                      c \$2.00                      d \$1.50                      e NG                      9 ☐ a ☐ b ☐ c ☐ d ☐ e
- 10 Someone from the bank will come at 10:15 A.M. Our bag must be in the office at 9:30 A.M. How much ahead of time is this?  
 f 15 min.                      g 30 min.                      h 45 min.                      i 1 hr. 15 min.                      j NG                      10 ☐ f ☐ g ☐ h ☐ i ☐ j
- 11 "I am one fourth through this book," said Gloria, as she reached page 60. How many pages has her book?  
 a 15                      b 30                      c 180                      d 240                      e NG                      11 ☐ a ☐ b ☐ c ☐ d ☐ e



Dot's Spelling Test Scores



12 How many words did Dot miss the last 2 weeks?

f 5 g 1 h 10 i 55 j NG

12 ☐ f ☐ g ☐ h ☐ i ☐ j

13 Which week did Dot score 23?

a 1st b 4th c 3rd d 2nd e NG

13 ☐ a ☐ b ☐ c ☐ d ☐ e

14 How many words better was she for the 4th week than for the 3rd week?

f 3 g 10 h 15 i 22 j NG

14 ☐ f ☐ g ☐ h ☐ i ☐ j

15 What is each girl's equal share for a party? You know the total cost. What else do you need to know?

- a how many guests there were  
b the cost of the cakes  
c the date of the party  
d the number of girls who share  
e No other information is needed.

15 ☐ a ☐ b ☐ c ☐ d ☐ e

16 There are 250 children in our school. Ten per cent of them were absent because of the hurricane. What is 10% of 250?

f 25 g 5 h 50 i 2500 j NG

16 ☐ f ☐ g ☐ h ☐ i ☐ j

Our class will visit the TV station. Here are some of our problems.

17 Miss Martin's class will go just two weeks later. What date will that be? To answer this you must know —

- a how many pupils can go  
b the date we go  
c how many parents go  
d which TV station it is  
e the number of pupils who will go

17 ☐ a ☐ b ☐ c ☐ d ☐ e

18 How many cars will we need for 30 pupils, 11 parents, and our teacher? Each car will take 6.

f 5 g 7 h 6 i 8 j NG

18 ☐ f ☐ g ☐ h ☐ i ☐ j

19 The number of TV listeners from 6 P.M. to 10 P.M. is estimated at an average of 15,000 in our city of 60,000. This is one person in every —

a 4 b  $2\frac{1}{2}$  c 15,000 d 45,000 e NG

19 ☐ a ☐ b ☐ c ☐ d ☐ e

20 We have our appointment at 10:15 A.M. When should we leave if we allow 10 minutes to load, 40 minutes to go, and 15 minutes to park and go into the station?

f 11:20 A.M. g 9:15 A.M. h 9:50 A.M. i 9:10 A.M. j NG

20 ☐ f ☐ g ☐ h ☐ i ☐ j

21 Fred can spell 12 words. This is 50% of the total. How many words is the total?

a 6 b 12 c 24 d 17 e NG

21 ☐ a ☐ b ☐ c ☐ d ☐ e

22 Harry has 40 4-cent stamps. Steve has 10. Steve has what fraction of the number of stamps Harry has?

f  $\frac{1}{4}$  g  $\frac{1}{10}$  h  $\frac{3}{10}$  i  $\frac{1}{3}$  j NG

22 ☐ f ☐ g ☐ h ☐ i ☐ j

23 One inch on a map is 4 miles. How far is  $1\frac{1}{2}$  inches on the map?

a  $1\frac{1}{2}$  mi. b 6 mi. c  $5\frac{1}{2}$  mi. d 4 mi. e NG

23 ☐ a ☐ b ☐ c ☐ d ☐ e

24 We need 2 melons for every 5 people. How many melons will we need for 30 people?

f 10 g 75 h 15 i 12 j NG

24 ☐ f ☐ g ☐ h ☐ i ☐ j

25 Ted has 6¢ and Joe has 30¢. Ted's money is what fraction of Joe's?

a  $\frac{1}{4}$  b  $\frac{1}{6}$  c  $\frac{1}{8}$  d  $\frac{1}{30}$  e NG

25 ☐ a ☐ b ☐ c ☐ d ☐ e

Mother, Sue, and Dave are shopping for new clothes. Here are some of their problems. Figure sales tax for number 28 only.

- 26 Jeans made of 10-ounce denim sell at 2 pair for \$4.98. How much is this per pair?

f 50¢ g \$2.44 h \$2.99 i \$9.96 j NG

26 ☐ f ☐ g ☐ h ☐ i ☐ j

- 27 What is the difference between the cost of a suit at \$22.95 and the total cost of slacks at \$7.95 and a sport coat at \$12.95?

a \$2.05 b \$1.05 c 95¢ d \$2.95 e NG

27 ☐ a ☐ b ☐ c ☐ d ☐ e

- 28 If the sales tax is 3¢ for each dollar spent, how much would it be for a dress at \$8.50 and a sweater at \$6.50?

f 26¢ g 45¢ h 42¢ i  $19\frac{1}{2}$ ¢ j NG

28 ☐ f ☐ g ☐ h ☐ i ☐ j

- 29 Socks are 3 pair for \$1.34 and 6 pair for \$2.65. How much would a person save by buying the larger number of pairs?

a  $\frac{1}{2}$ ¢ b 1¢ c \$1.34 d 3¢ e NG

29 ☐ a ☐ b ☐ c ☐ d ☐ e

Road Distance in Miles

	Troy	Kane	York	Clay	Burr
Kane	80				
York	40	50			
Clay	50	120	70		
Burr	35	95	45	25	
Rice	50	85	35	45	30

- 30 From York to Clay is how much farther than from Troy to York?

f 5 mi. g 10 mi. h 30 mi.  
i 20 mi. j NG

30 ☐ f ☐ g ☐ h ☐ i ☐ j

- 31 Which town is farthest from Kane?

a Clay b York c Troy  
d Rice e Burr

31 ☐ a ☐ b ☐ c ☐ d ☐ e

- 32 Which town is nearest to York?

f Troy g Kane h Rice  
i Clay j Burr

32 ☐ f ☐ g ☐ h ☐ i ☐ j

- 33 Alice bought 4 pounds of fruit. Her change from a dollar bill was 40¢. What did the fruit cost per pound?

a 5¢ b 15¢ c 10¢ d 60¢ e NG

33 ☐ a ☐ b ☐ c ☐ d ☐ e

A = 4 C = 5  
B = 8 D = 12

- 34 How many is  $(3 \times B) - A - C$ ?

f 1 g 15 h 2 i 17 j NG

34 ☐ f ☐ g ☐ h ☐ i ☐ j

- 35 Bill worked 15 problems out of 20. What per cent is that?

a  $\frac{3}{4}$  b 15 c 50 d 75 e NG

35 ☐ a ☐ b ☐ c ☐ d ☐ e

- 36 A sales tax of 3% on \$10 would be —

f  $3\frac{1}{3}$ ¢ g  $33\frac{1}{3}$ ¢ h 30¢ i \$3.00 j NG

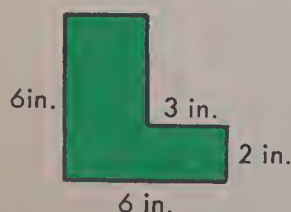
36 ☐ f ☐ g ☐ h ☐ i ☐ j

- 37 The girls are what fraction of our class? To find out, —

a divide number of boys by girls c divide total class by girls  
b add boys and girls; divide by 2 d divide number of girls by number in class  
e subtract boys from girls

37 ☐ a ☐ b ☐ c ☐ d ☐ e

Figure A

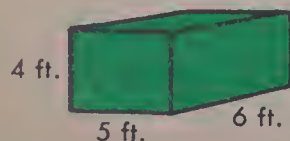


- 38 How many square inches are there in Figure A?

f 17 g 30 h 24 i 36 j NG

38 ☐ f ☐ g ☐ h ☐ i ☐ j

Figure B



- 39 How many cubic feet will the box in Figure B hold?

a 20 b 24 c 120 d 30 e NG

39 ☐ a ☐ b ☐ c ☐ d ☐ e







# **Cooperative School and College Ability Tests**

**School Ability  
Test**

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**Form 4 A**

## General Directions

This is a test of some of the skills you have been learning ever since you first entered school. You should take it in the same way that you would work on any other new and interesting assignment.

The test is divided into four parts, which you will take one at a time. Give each one your close attention and do your best on every question. You probably will find some of the questions quite easy and others more difficult. You are *not* expected to answer every question correctly.

There are a few general rules for taking this test that will help you to earn your best score:

- Work carefully, but do not spend too much time on any one question. It usually is better to answer first all of the questions in the part that you know well and can answer quickly. Then go back to the questions that you want to think about.
- If you work at average speed you will have plenty of time to read and answer all of the questions. By leaving until last the questions that are most difficult, you will make best use of your time.
- You may answer questions even when you are not perfectly sure that your answers are correct. Your score will be the number of correct answers you mark.
- Put *all* of your answers on the answer sheet. This test booklet should not be marked in any way. Your examiner will give you an extra sheet of scratch paper to use when you do the number problems.
- Fill in all the information called for on the answer sheet and **PRINT** your name so that it can be read.
- Make sure that you understand instructions *before* you start work on any part. Ask the examiner to repeat the instructions if you do not understand exactly what you are to do.
- Make your answer marks on the answer sheet heavy and black. If you change your mind about an answer, be sure to erase your first mark completely.

If you give this test your best effort, your score will provide a good estimate of your ability in these important skills.

**DIRECTIONS FOR PART I**

Each question in Part I consists of a sentence in which one word is missing; a blank indicates where the word has been removed from the sentence. Beneath each sentence are five words, one of which is the missing word. You are to select the missing word by deciding which one of the five words *best* fits in with the meaning of the sentence.

**Sample Question**

We had worked hard all day so that by evening we were quite (        ).

- A** small      **B** tired      **C** old  
**D** untrained      **E** intelligent

If you understand the sample sentence you will realize that “tired” is the missing word because none of the other words fits in with the meaning of the sentence. Next, on the answer sheet, you find the line numbered the same as the question and blacken the space which has the same letter as the missing word. Because “tired” is the correct word to use in the sample sentence, and its letter is **B**, the space marked **B** on the answer sheet is blackened. See how it has been marked on the answer sheet. Do *not* make any marks in your test booklet.

**Do not turn this page until you are told to do so.**

**PART I / TIME: 15 MINUTES**

- 1** Because his ( ) was broken he had no idea what time it was.  
**A** bicycle    **B** watch    **C** toy  
**D** leg    **E** spirit
- 2** He had ( ) many problems in his life, but he could not find the answer to this one.  
**F** avoided    **G** completed    **H** seen  
**J** hated    **K** solved
- 3** Because the horses carried large packs, they were considered ( ) by the people living on the mountain.  
**A** useful    **B** pleasant    **C** lazy  
**D** old-fashioned    **E** expensive
- 4** It looks like ice cream, and it tastes like ice cream—but it's not ( ).  
**F** cake    **G** ice cream  
**H** frozen pudding    **J** sherbet  
**K** lemonade
- 5** When Mark suddenly realized he was singing alone, he hesitated and slipped ( ) behind his sister.  
**A** shyly    **B** wisely    **C** longingly  
**D** dangerously    **E** carelessly
- 6** There is always dust in the air, and many other small ( ), known and unknown.  
**F** beings    **G** airplanes    **H** particles  
**J** diseases    **K** birds
- 7** After swimming a few strokes, the horses found ( ) under their feet again and waded onto the bank.  
**A** water    **B** hay    **C** nothing  
**D** stones    **E** hoofs
- 8** There is little ( ) to show that spiders, as a whole, are dangerous.  
**F** opinion    **G** history    **H** feeling  
**J** evidence    **K** injury
- 9** When he lost his birth certificate, he went to the recorder's office for ( ) copy.  
**A** a definite    **B** a duplicate  
**C** an original    **D** a forged  
**E** a patented
- 10** Wherever insufficient water is a problem, many farmers have been willing to accept ( ) about conserving moisture.  
**F** criticism    **G** failure    **H** excuses  
**J** advice    **K** wisdom
- 11** I can remember the woods in their autumn dress and hear the ( ) we made as we ran through the fallen leaves.  
**A** rustle    **B** clatter    **C** racket  
**D** din    **E** laughter
- 12** ( ) the farmers worked every day and tried everything, the withering continued.  
**F** Because    **G** Since    **H** If  
**J** Although    **K** When
- 13** The old glassmaker bent the strips of lead, which had been heated just enough to make them ( ).  
**A** glow    **B** stiff    **C** molten  
**D** elastic    **E** flexible
- 14** ( ) requires many workers, large factories, and the ability to organize and sell.  
**F** Government    **G** Modern farming  
**H** Mass production    **J** Financing  
**K** Transportation



- 15** The right to vote is one of the priceless heritages of all Americans; that right loses its value unless put to ( ).  
**A** rest      **B** trial      **C** debate  
**D** use      **E** vote
- 16** His ( ) for his boss grew as rapidly as his fondness.  
**F** dislike      **G** respect      **H** friendliness  
**J** work      **K** shame
- 17** The altimeter, an instrument used in airplanes to indicate height above sea level, works on the ( ) that air pressure decreases with increased altitude.  
**A** belief      **B** principle      **C** suspicion  
**D** chance      **E** plan
- 18** Although the soldiers complained that they were not being properly taught, or grumbled that they did not like the food, the long hours of work did not seem to ( ) them.  
**F** deceive      **G** help      **H** bother  
**J** change      **K** confuse
- 19** The fury of the storm ( ) in the night, and in the morning the sun appeared in all its glory.  
**A** ceased      **B** howled      **C** grew  
**D** steadied      **E** intensified
- 20** On the last day of April, 1900, Casey Jones met his death, and since then he has become the ( ) hero of railroad engineers.  
**F** unsung      **G** unbelievable  
**H** legendary      **J** consistent      **K** current
- 21** No one knows how the World Series will come out, but hardly anyone will decline to make a ( ).  
**A** decision      **B** claim      **C** mistake  
**D** guarantee      **E** prediction
- 22** Because of the timely nature of the project, ( ) ran high in the group.  
**F** interest      **G** expense      **H** discord  
**J** understanding      **K** humor
- 23** It is difficult to distinguish between intentional and unintentional errors, but certainly some errors or distortions are ( ) made.  
**A** seldom      **B** deliberately  
**C** effectively      **D** carelessly      **E** always
- 24** Some selfish, short-sighted men try to get rich quickly without realizing that their ( ) may not only harm others but destroy their own wealth as well.  
**F** future      **G** money      **H** greed  
**J** hoarding      **K** pastime

- 25** Porters ( ) with luggage pushed through the crowd.  
**A** weak      **B** fleeing      **C** seen  
**D** trusted      **E** laden
- 26** If we choose to follow a course of ( ), we shall build a sort of wall around ourselves and have little to do with the rest of the world.  
**F** pacificism      **G** aggression  
**H** jealousy      **J** militarism  
**K** isolationism
- 27** Poverty-stricken, unspeakably ( ), the caravan creaked along, advancing at a snail's pace into the dismal, bluish-green infinity.  
**A** clothed      **B** foolish      **C** cruel  
**D** forlorn      **E** wise
- 28** Armies, navies, planes are still on hand, but the trend is toward less rather than more ( ) power.  
**F** divided      **G** atomic      **H** horse  
**J** military      **K** political
- 29** He found it easy to make elaborate plans but difficult to ( ) them.  
**A** arrange      **B** execute      **C** select  
**D** forget      **E** ascertain
- 30** Because large bodies of water do not heat or cool as rapidly as land masses, we can expect areas along a seacoast to have ( ) temperatures than areas farther inland.  
**F** higher      **G** lower      **H** better  
**J** worse      **K** steadier



**Stop.** If you finish before time is called, check your work on this part. Do not go on to Part II until you are told to do so.

---

**DIRECTIONS FOR PART II**

There are 25 problems in Part II of the test. Following each problem there are five suggested answers. Work each problem in your head or on a piece of scratch paper. Then look at the five suggested answers and decide which one is correct. Blacken the space under its letter on the answer sheet.

Because the correct answer to the sample problem is 586, which is lettered **F**, the space marked **F** on the answer sheet is blackened. See how it has been marked on the answer sheet. Do *not* make any marks in your test booklet.

**Sample Problem**

5413	<b>F</b>	586	<b>G</b>	596	<b>H</b>	696
<u>-4827</u>	<b>J</b>	1586	<b>K</b>	None of these		

**Do not turn this page until you are told to do so.**

**PART II / TIME: 20 MINUTES**

$$\begin{array}{r} 1 \quad 475 \\ + 528 \\ \hline \end{array}$$

- A** 993  
**B** 1003  
**C** 1013  
**D** 1113  
**E** None of these

$$\begin{array}{r} 2 \quad 502 \\ - 267 \\ \hline \end{array}$$

- F** 235  
**G** 245  
**H** 335  
**J** 345  
**K** None of these

$$\begin{array}{r} 3 \quad 4876 \\ \times \quad 7 \\ \hline \end{array}$$

- A** 33,092  
**B** 33,632  
**C** 34,132  
**D** 34,832  
**E** None of these

$$4 \quad \$14.25 - \$3 = (?)$$

- F** \$11.25  
**G** \$13.95  
**H** \$14.22  
**J** \$14.28  
**K** None of these

$$\begin{array}{r} 5 \quad \frac{3}{5} \\ + \frac{7}{30} \\ \hline \end{array}$$

- A**  $\frac{2}{7}$     **B**  $\frac{8}{15}$   
**C**  $\frac{4}{5}$     **D**  $\frac{13}{15}$   
**E** None of these

$$\begin{array}{r} 6 \quad 5\frac{1}{3} \\ - 2\frac{2}{3} \\ \hline \end{array}$$

- F**  $2\frac{1}{3}$     **G**  $2\frac{2}{3}$   
**H**  $3\frac{1}{3}$     **J**  $3\frac{2}{3}$   
**K** None of these

$$\begin{array}{r} 7 \quad 7002 \\ - 1509 \\ \hline \end{array}$$

- A** 5493  
**B** 5593  
**C** 6493  
**D** 6593  
**E** None of these

$$\begin{array}{r} 8 \quad 6.1 \\ \times .5 \\ \hline \end{array}$$

- F** 0.35  
**G** 3.05  
**H** 30.5  
**J** 35  
**K** None of these

$$\begin{array}{r} 9 \quad 3\frac{2}{3} \\ + 5\frac{3}{4} \\ \hline \end{array}$$

- A**  $8\frac{5}{7}$     **B**  $8\frac{5}{12}$   
**C**  $9\frac{5}{7}$     **D**  $9\frac{5}{12}$   
**E** None of these

$$\begin{array}{r} 10 \quad 478 \\ \times 900 \\ \hline \end{array}$$

- F** 4,302.00  
**G** 360,200  
**H** 430,200  
**J** 432,000  
**K** None of these

$$11 \quad 25 \overline{)5200}$$

- A** 28  
**B** 200  
**C** 208  
**D** 280  
**E** None of these

$$12 \quad \frac{3}{5} \div \frac{1}{5} = (?)$$

- F**  $\frac{3}{25}$     **G**  $\frac{2}{5}$   
**H**  $\frac{4}{5}$     **J** 3  
**K** None of these

$$13 \quad \begin{array}{r} 5 \text{ hours } 10 \text{ minutes} \\ - 1 \text{ hour } 55 \text{ minutes} \\ \hline \end{array}$$

- A** 3 hours 15 minutes  
**B** 3 hours 55 minutes  
**C** 4 hours 15 minutes  
**D** 4 hours 45 minutes  
**E** None of these

$$14 \quad 1\frac{1}{3} \times 2\frac{1}{3} = (?)$$

- F**  $2\frac{1}{9}$     **G**  $2\frac{2}{3}$   
**H**  $3\frac{1}{9}$     **J**  $9\frac{1}{3}$   
**K** None of these

$$15 \quad 12\frac{1}{2} \div \frac{1}{2} = (?)$$

- A**  $6\frac{1}{4}$     **B** 12  
**C**  $24\frac{1}{4}$     **D** 25  
**E** None of these



**16**  $0.3 \times 0.3 = (?)$

- F** 0.009  
**G** 0.09  
**H** 0.6  
**J** 0.9  
**K** 9.0

**17** The average of 91, 98, and 99 is

- A** 93  
**B** 96  
**C** 98  
**D** 144  
**E** None of these

**18** 
$$\begin{array}{r} 5 \\ -4\frac{1}{4} \\ \hline \end{array}$$

- F**  $\frac{1}{4}$       **G**  $1\frac{1}{4}$   
**H**  $1\frac{3}{4}$       **J**  $9\frac{1}{4}$   
**K** None of these

**19**  $\frac{1}{4}$  of 0.24 = (?)

- A** 0.06  
**B** 0.6  
**C** 0.96  
**D** 9.6  
**E** None of these

**20**  $3\% \times 9 = (?)$

- F** 0.27  
**G** 2.7  
**H** 3  
**J** 27  
**K**  $33\frac{1}{3}$

**21**  $8\overline{)0.04}$

- A** 0.005  
**B** 0.05  
**C** 0.50  
**D** 5.0  
**E** None of these

**22**  $7.2 + 0.08 + 5 + 0.203 = (?)$

- F** 0.288  
**G** 7.983  
**H** 8.11  
**J** 12.483  
**K** 14.31

**23**  $2\overline{)9 \text{ feet } 8 \text{ inches}}$

- A** 3 feet 4 inches  
**B** 4 feet 4 inches  
**C** 4 feet 9 inches  
**D** 4 feet 10 inches  
**E** None of these

**24** Which of the following is the largest?

- F**  $\frac{1}{8} + \frac{1}{8}$   
**G**  $\frac{1}{8} - \frac{1}{8}$   
**H**  $\frac{1}{8} \times \frac{1}{8}$   
**J**  $\frac{1}{8} \div \frac{1}{8}$   
**K**  $\frac{1}{8}\%$  of  $\frac{1}{8}$

**25** What is 100% of 800?

- A** 8  
**B** 80  
**C** 8000  
**D** 80,000  
**E** None of these



**Stop.** If you finish before time is called, check your work on this part. Do not go back to the previous part. Do not go on to Part III until you are told to do so.

### DIRECTIONS FOR PART III

Each of the questions in Part III consists of one word in large letters followed by five words or phrases in small letters. Read the word in large letters. Then pick, from the words or phrases following it, the one whose meaning is closest to the word in large letters. For example:

#### Sample Question

chilly

- A** tired      **B** nice      **C** dry  
**D** cold      **E** sunny

In order to find the correct answer you look at the word **chilly** and then look for a word or phrase below it that has the same or almost the same meaning. When you do this you see that “cold” is the answer because “cold” is closest in meaning to the word “chilly.” Next, on the answer sheet you find the line numbered the same as the question and blacken the space which has the same letter as the word you have selected as the correct one. Because “cold” is the correct answer to the sample question, the space marked **D** on the answer sheet is blackened. See how it has been marked on the answer sheet. Do *not* make any mark in your test booklet.

**Do not turn this page until you are told to do so.**



**PART III / TIME: 10 MINUTES****1** harvest

- A** gathering of crops
- B** fall sunset
- C** yearly feast
- D** happy memory
- E** picture of fields

**2** stray

- F** wander away
- G** pour water on
- H** swim under
- J** wait for
- K** knock down

**3** plump

- A** placid
- B** dull
- C** short
- D** neat
- E** chubby

**4** intelligent

- F** strong
- G** unusual
- H** peculiar
- J** wise
- K** diligent

**5** abandon

- A** win
- B** toss
- C** give up
- D** argue with
- E** think

**6** prowl

- F** climb into
- G** roar
- H** gaze at
- J** sneak around
- K** grumble

**7** punishment

- A** hindrance
- B** penalty
- C** removal
- D** failure
- E** banishment

**8** predict

- F** foretell
- G** repeat
- H** surprise
- J** prepare
- K** reply

**9** restless

- A** hopeless
- B** aimless
- C** uneasy
- D** busy
- E** tired

**10** cavern

- F** group of people
- G** mountain
- H** flock of birds
- J** carnival
- K** underground space

**11** absorb

- A** forgive
- B** get the answer
- C** dissolve
- D** soak up
- E** act foolishly

**12** monarch

- F** soldier
- G** huntsman
- H** ruler
- J** prisoner
- K** builder

**13** vague

- A** weak
- B** inattentive
- C** mild
- D** popular
- E** not clear

**14** imitate

- F** set forth
- G** copy
- H** join
- J** be quiet
- K** make up

**15** dismal

- A** formal
- B** gloomy
- C** rainy
- D** endless
- E** freakish

**16** biography

- F** list of writings
- G** account of a life
- H** study of living organisms
- J** reading maps
- K** criticism of a painting

**17** antique

- A** beautiful
- B** broken
- C** crawling
- D** old
- E** trembling

**18** retrieve

- F** get back
- G** delay punishment
- H** reunite
- J** shore up
- K** support with evidence

**19** common

- A** moving
- B** encouraging
- C** queer
- D** simple
- E** usual

**20** imply

- F** insert
- G** hint at
- H** agree to
- J** wheedle
- K** simplify

**21** edible

- A** movable
- B** good to eat
- C** qualified for
- D** cooperative
- E** brittle

**22** torture

- F** agony
- G** evil
- H** criminal
- J** boredom
- K** castle

**23** recollect

- A** acquire
- B** gather
- C** wreck
- D** neglect
- E** remember

**24** blunder

- F** swagger
- G** defect
- H** vulgarity
- J** deception
- K** error

**25** corral

- A** enclosure
- B** sea water
- C** lasso
- D** knot
- E** cattle

**26** dirge

- F** hymn of praise
- G** spiritual
- H** mournful song
- J** folk song
- K** ballad

**27** calculate

- A** deposit
- B** separate
- C** compute
- D** continue
- E** provoke

**28** immortal

- F** unpleasant
- G** secret
- H** wicked
- J** undying
- K** dead

**29** therapeutic

- A** religious
- B** violent
- C** corrupt
- D** healing
- E** speculative

**30** audacity

- F** loudness
- G** leadership
- H** ability to hear
- J** fear
- K** boldness



**Stop.** If you finish before time is called, check your work on this part. Do not go back to either previous part. Do not go on to Part IV until you are told to do so.

### DIRECTIONS FOR PART IV

There are 25 problems in Part IV of the test. Following each problem there are five suggested answers. Work each problem in your head or on a piece of scratch paper. Then look at the five suggested answers and decide which one is correct. Blacken the space under its letter on the answer sheet.

#### Sample Problem

Four \$10-bills are equal to how many \$5-bills?

- F** 20      **G** 10      **H** 8
- J** 40      **K** 2

Because the correct answer to the sample problem is 8, which is lettered **H**, the space marked **H** on the answer sheet is blackened. See how it has been marked on the answer sheet.

Do *not* make any marks in your test booklet.

**Do not turn this page until you are told to do so.**

**PART IV / TIME: 25 MINUTES**

- 1 In a girl scout cookie sale, Mary sold 15 boxes of cookies, Sue sold 23, and Jane sold 29. How many boxes of cookies did the three girls sell in all?
  - A 56
  - B 57
  - C 66
  - D 67
  - E 77
- 2 A school bus makes four round trips a day. How many round trips does the bus make in 180 days?
  - F 184
  - G 360
  - H 420
  - J 720
  - K 1440
- 3 Mrs. Brown had 2 bottles of milk left over on Sunday night. On Monday she bought 3 bottles of milk and her family drank 4 bottles. How many bottles of milk were left?
  - A 1
  - B 2
  - C 3
  - D 5
  - E 9
- 4 If Betty bought a dress for \$7.50, a hat for \$2.50 and a belt for \$3.00, how much of her \$15.00 clothing allowance remains?
  - F \$1.00      G \$1.50
  - H \$2.00      J \$3.00
  - K None of these
- 5 Ann bought 8 stamps at 6 cents per stamp. Which of the following groups of coins would be the right amount to pay for the stamps?
  - A 3 dimes, 2 nickels, 3 pennies
  - B 4 dimes, 2 nickels, 3 pennies
  - C 1 quarter, 1 dime, 1 nickel, 3 pennies
  - D 1 quarter, 3 nickels, 3 pennies
  - E 1 quarter, 2 dimes, 3 pennies
- 6 When Mr. Green's suitcase was packed for a trip, it weighed 33 pounds. Mrs. Green's suitcase weighed 39 pounds. After Mr. Green added some books, his suitcase weighed the same as Mrs. Green's. How many pounds did the books weigh?
  - F 5
  - G 6
  - H 33
  - J 39
  - K There is no way to tell because the books were not weighed.
- 7 Jim bought  $\frac{1}{2}$  dozen fishing hooks. The hooks cost 50 cents each, and a 3% tax was added. What was his total bill?
  - A \$2.58
  - B \$2.97
  - C \$3.09
  - D \$6.18
  - E \$12.36
- 8 If a student read an average of 25 pages an hour, how many hours of reading time did it take him to finish a 300-page book?
  - F 5      G 12
  - H 125      J 275
  - K 360
- 9 How many inches are there in  $2\frac{1}{2}$  feet?
  - A 24
  - B 26
  - C 28
  - D 30
  - E 32
- 10 There are 6 loaves of bread for 30 people. If each loaf is cut into 20 slices, how many slices will each person get?
  - F  $\frac{2}{3}$
  - G  $1\frac{1}{2}$
  - H 4
  - J 6
  - K 9

Go on to the next page.

- 11** If three pencils cost 10 cents, then how much do 1 dozen pencils cost?
- A** \$0.20  
**B** \$0.30  
**C** \$0.40  
**D** \$0.50  
**E** \$1.20
- 12** Susan's father is three times as old as Susan. In 5 years Susan will be 20. How old is her father now?
- F** 15  
**G** 30  
**H** 45  
**J** 60  
**K** 75
- 13** An odometer registers the distance traveled by an automobile. If a car's odometer registered 7910 miles at the beginning of a trip, what should it register after the car was driven 3 hours at the average speed of 30 miles per hour?
- A** 90  
**B** 7920  
**C** 7943  
**D** 7940  
**E** 8000
- 14** At a class play 450 tickets were sold at 20 cents each. If it cost \$20 to put on the play, how many dollars did the class have left?
- F** 50  
**G** 70  
**H** 86  
**J** 90  
**K** 110
- 15** Florence had  $\frac{3}{4}$  of a yard of ribbon. She gave  $\frac{1}{3}$  of a yard to her sister. What part of a yard of ribbon did Florence have left?
- A**  $\frac{1}{3}$   
**B**  $\frac{5}{12}$   
**C**  $\frac{1}{2}$   
**D**  $\frac{2}{3}$   
**E**  $\frac{3}{4}$
- 16** Jim is planning a summer trip with some of his classmates. If he saves \$3 a week, how many weeks will it take him to save the \$65 he needs for the trip?
- F** 19  
**G** 20  
**H** 21  
**J** 22  
**K** 195
- 17** If fancy buttons cost 15 cents each, how much would it cost to buy buttons for two dresses that need four buttons each?
- A** \$0.60  
**B** \$0.75  
**C** \$0.85  
**D** \$0.90  
**E** \$1.20
- 18** Three sides of a square field need 60 feet of fencing. How many feet of fencing will be needed for the fourth side?
- F** 15  
**G** 20  
**H** 30  
**J** 40  
**K** 80



- 19** The taxi fare in a city is 25 cents for the first  $\frac{1}{4}$  of a mile, and 5 cents for every additional  $\frac{1}{4}$  of a mile. What would be the cost of a  $1\frac{1}{2}$  mile trip?
- A** \$0.30  
**B** \$0.35  
**C** \$0.40  
**D** \$0.50  
**E** \$0.55
- 20** Ellen bought a game for 30 cents and a ball for 10 cents. What is the smallest number of coins the sales clerk can use in giving her change from \$1.00?
- F** 2  
**G** 3  
**H** 4  
**J** 6  
**K** 60
- 21** What fraction of 5 gallons is 3 quarts? (1 gallon = 4 quarts.)
- A**  $\frac{3}{20}$   
**B**  $\frac{1}{4}$   
**C**  $\frac{4}{15}$   
**D**  $\frac{5}{12}$   
**E**  $\frac{3}{5}$
- 22** A stick 8 feet long placed upright in the ground casts a shadow 5 feet long. At the same time, a tree casts a shadow 15 feet long. How many feet high is the tree?
- F**  $9\frac{3}{8}$   
**G** 16  
**H** 24  
**J** 30  
**K** 40
- 23** If one-half of 6 apples costs 15 cents, what is the cost of one-third of 12 apples?
- A** \$0.05  
**B** \$0.20  
**C** \$0.30  
**D** \$0.40  
**E** \$0.60
- 24** Elliot rode his bike 3 miles in 15 minutes. What was his average speed in miles per hour for this ride?
- F** 5  
**G** 12  
**H** 15  
**J** 18  
**K** 45
- 25** How many hours is  $\frac{1}{21}$  of a week?
- A** 6  
**B** 8  
**C** 12  
**D** 20  
**E** 72

If you finish before time is called,  
check your work on this part. Do  
not go back to any previous part.















**B29906**